NOV 8 1934

Dynamic Approach to Earthquake and Wind Design . . . Hydrological Data from Miami Conservancy District . . . Thin or Thick Road Surfaces? . . . Muskingum Valley Flood-Control Dams . . . Advice for Contractors Entering Federal Work—I

Engineering News-Record

McGraw-Hill Publishing Co., Inc.
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November 1, 1934

Bonneville Dam on the Columbia River

Forty miles above Portland, Oregon, the federal government is building a great power dam and the highest single-lift navigation lock in the world . . . The design of this $31,000,000 project is striking and instructive

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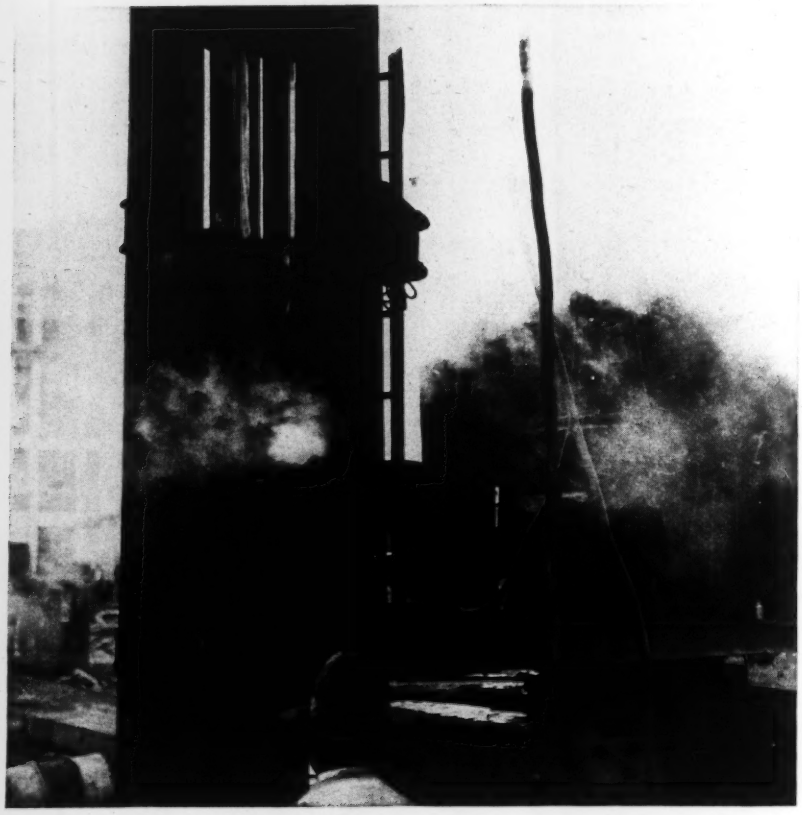

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For Relief *that does not obstruct Recovery*

IN A little more than two months Congress will reconvene and the President now is formulating a program for submission to the legislators. Many signs indicate his recognition that the action of the next session will exert an important influence upon national recovery and upon his leadership.

He carries a heavy responsibility and he must take into his reckoning many aspects of the national welfare. So, in speaking for the construction industry, this writer would avoid too insistent a pressure in behalf of its special interest. Construction must stand or fall with general recovery; it cannot hope to prosper without general prosperity. What is for the general good will be for its good also, and nothing that is not in the general interest can possibly be in its interest. These comments are offered with full recognition of all this.

One of the most pressing of the President's problems is that of relief; i.e., direct and immediate help to those whose unemployment has brought distress to themselves and their families. His every public utterance has indicated his serious concern over this problem, so insistent and so inevitable. Everyone, whatever his station or interest, concurs in its claim to priority.

But it betokens no lack of sympathy with this need for the construction industry to ask that it be met through measures that will not penalize an already heavily burdened industry and retard its progress toward recovery.

All agree that personal relief is essential to social stability. But all agree also that an increased construction activity is essential to recovery. Of what good is stability unless we can build upon it? Of what avail to steady the ship by devices that but obstruct its progress toward safety?

The public works program was undertaken to conserve employment in construction and its dependent industries and to stimulate the durable goods industries until private enterprise again could resume its normal investment function. It has helped to bridge that gap and today we have indications that private capital is about to take an increasing part.

What this program has done it has accomplished despite difficulties, many of which have resulted from a tendency to confuse its objective with that of direct relief. The distinction should be clear. The public works program seeks to create employment in the normal processes of a vast basic industry and others dependent on it. Relief seeks merely to provide a bare subsistence for those that cannot find employment anywhere. The one fosters productive employment in industry and trade; the other is an expedient to avert social collapse. The one is an important element in a recovery program; the other is an emergency stop-gap. The one seeks to restore normal and healthy conditions; the other tends to perpetuate abnormal and unhealthy conditions.

So today the construction industry asks the President and the new Congress to formulate their relief program without interference with the public works effort. It asks them to bear in mind that these are distinct undertakings, designed to achieve different objectives. Any attempt to mix them may but retard that recovery which alone can put an end to the need for relief.

Let us have whatever relief program may be necessary, based on sound principles of relief; let us continue a public works program that will create normal employment through normal channels and thereby forward the normal functioning of industry and trade.

Recovery implies just this resumption of normal processes.

Willard Chevalier

ENGINEERING NEWS-RECORD

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The new brick pavement in front of Independence Hall, Philadelphia

"THAT *New* BRICK PAVING...HOW *Well* IT LOOKS AND HOW *Easy* IT RIDES"

Recently Philadelphia brick-paved Chestnut and Walnut Streets which pass historic Independence Hall. Leigh Mitchell Hodges, writing in the Philadelphia Evening Bulletin, gives an interesting account of his impressions of the Chestnut Street pavement together with a psychological forecast of its effects which are republished here with full acknowledgements.

• • •

"That new brick paving in Chestnut Street—how well it looks and how easy it rides! What a lot of people stop to watch the workmen smoothing the concrete and laying the vitrified oblongs, then pouring on the hot, black tar and peeling it off in long strips! How fine the street will look when the whole center-city length is completed!

"Everyone seems pleased with it, and a bit proud. Pleased with its appearance, and proud of such a thorough job. The way a man feels when he has cut the grass with a lawn mower that leaves no ridges—and saved a dollar, to boot. The way anyone is apt to feel at sight of a really good piece of work, whether it be a foot square or a mile long.

"I would not be surprised if this new paving already had made many of us more particular as to the way our shoes and clothes look. Such a neat, attractive street tends to turn thought in the direction of self-appraisal . . .

"Surroundings are quite contagious. Consciously or otherwise, we live up or down to them. Ruts, humps and patches do not inspire us to walking straighter or holding our shoulders back. Shopkeepers in dingy, ill-kept streets never are very particular about their shop-windows. It's a safe bet that repaved Chestnut Street will result in a general toning up of shops all along the way. And this will attract more customers. That which pleases pays.

"'That's the way the city should do everything,' said an onlooker. 'No big municipality should be content with half-wayness. Makeshift makes for shiftlessness.'" . . .

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In the News:

INSISTENT RUMORS continue from Washington, indicating that federal relief is out of the picture and that the Administration has swung to a sizable public-works program for presentation to the next Congress.

THE ENGINEERING BOARD appointed by the Minneapolis-St. Paul Sanitary District to determine the best method of sewage treatment for the district reported last Monday in favor of plain sedimentation and chemical precipitation. The chemical-treatment installation would be by far the largest in this country, providing for the treatment of 134 m.g.d.

AFTER EIGHTEEN MONTHS of active construction operations, the foundations for the San Francisco-Oakland Bay Bridge are complete, steel erection is under way, and cable stringing is scheduled to start about next February.

HARVARD UNIVERSITY announces that in 1935-36 its engineering school will be conducted as the Graduate School of Engineering, and undergraduate instruction will be confined to the college.

BIDS for 5,000,000 bbl. of cement will be called by the Metropolitan Water District to provide for all the work on the Colorado River Aqueduct. This is reported to be a record cement order.

DURING THE WINTER 51 CCC camps will work on check dams and other erosion-control structures in 22 states under the direction of the Erosion Control Service. Their work supplements local labor within these demonstration areas.

AT THE CLOSE of the third year of its operation the George Washington Bridge across the Hudson River at New York has handled 17,600,000 vehicles, and the last 12 months showed a 4 per cent increase over the previous period.

ON SUNDAY, OCT. 28, San Francisco officially turned the valve that started water flowing through the 155-mile Hetch Hetchy Aqueduct. The speaker of the day was Secretary Ickes, who emphasized the need for the conservation of natural resources.

In This Issue:

ONE OF THE major federal projects financed by the PWA and an outstanding hydro-electric and navigation development is well under way on the Columbia River about 40 miles above Portland, Ore. The selection of the Bonneville Dam site, the foundation conditions, design features and construction procedure are reviewed in the present article.

EARTHQUAKES AND HURRICANES invariably take toll of building walls but seldom damage a building frame. This result being inherent in the method of design that considers only the stability of the frame, it has long seemed desirable to some engineers to develop a method of design (and of construction) that would treat the walls and floor slabs as structural elements along with the columns and beams. Such a method is presented in this issue.

COLLECTION of valuable hydrological data continues with the maintenance and operation of the Miami Conservancy District, and information on the rainfall-runoff ratio and river hydraulics is presented by C. S. Bennett.

DESIGN THINKING on the problem of flexible road surfacing, pointing out the relative merits of a thin or a thick mat, is presented from West Virginia and Oregon.

INTRICACIES OF CONTRACTING in carrying out construction work for the federal government are little known to many contractors now entering this expanding field. A series of articles starting in this issue presents pertinent information on the subject.

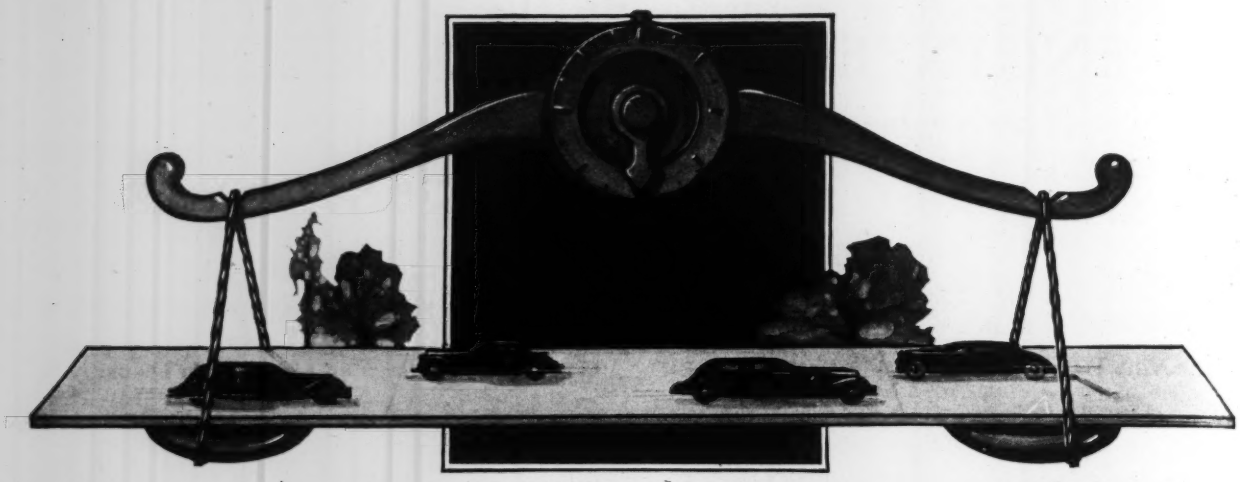
WEIGHT REDUCTION was secured by the use of aluminum members in a small hand-operated bascule footbridge built at an Aluminum Company plant.

PROGRESS on the Muskingum River water-conservation project has advanced to permit a review of the approved program of dams to be constructed. The status of this revised plan in the routine of acceptance by the district is outlined by the chief engineer.

Coming Articles:

SEATTLE is constructing a seawall of unique design along its harbor front, to improve the adjacent street area which carries railroad tracks and heavy trucking traffic. The design and the method of building the wall and relieving platform are described in an article to be published next week.

THE MERCURY-STEAM-ELECTRIC plant of the General Electric Co. at Schenectady, N. Y., has unusual engineering significance apart from the interest which naturally centers in it as the most modern example of the use of mercury vapor in power generation and steam production. It introduces a new development in industrial building form, in which only those parts of the equipment that require protection from the weather are enclosed, and it includes a remarkable aggregation of arc-welding details, including some of the heaviest members yet fabricated by this process.



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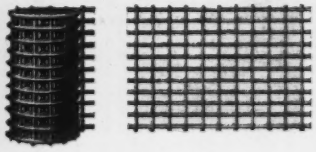

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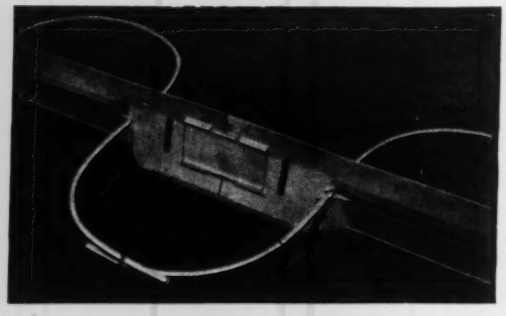

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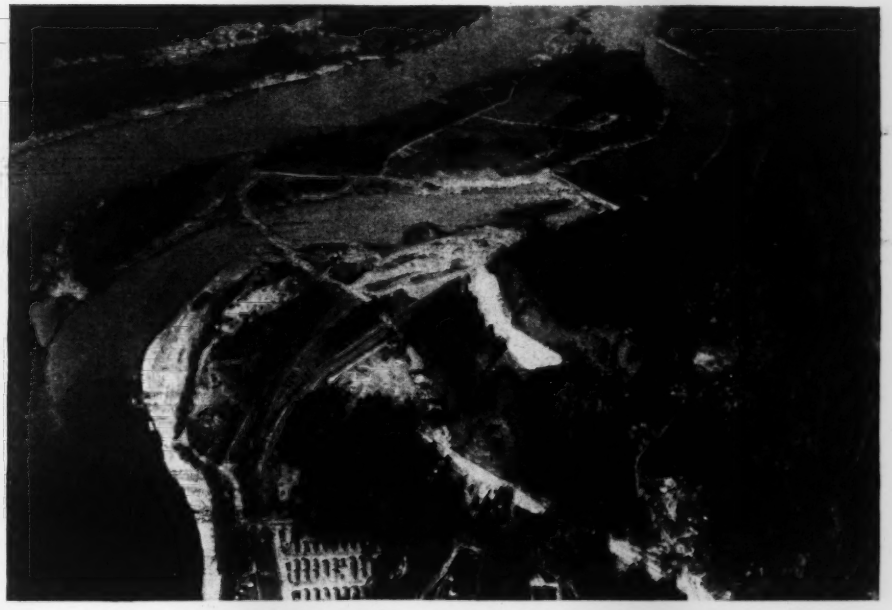


FIG. 1—BONNEVILLE DAM is to span the Columbia River where Bradford Island divides the river into two channels. This picture shows the south channel closed off by cofferdams for excavation of the power-house site. The construction camp is at the lower left center.

Brubaker Aerial Surveys.

Bonneville Dam on the Columbia

Power development and navigation improvements combined in the dam being built across the Columbia River 40 miles above Portland, Ore.—Unusual geological conditions controlled design and location of dam, power house and locks

WITH only preliminary plans and without having had opportunity for adequate exploration of the site, the Corps of Engineers, U. S. Army, under urgent pressure from the Public Works Administration to put men to work, nearly a year ago let the first contract for the construction of a navigation and power dam across the Columbia River at Bonneville, Ore., about 140 miles above the mouth of the river and 40 miles above the city of Portland. This dam, located just above the limits of ordinary tidal effects and a little below Cascade Rapids, is the first of a series of ten dams recommended by the Corps of Engineers in its report to Congress on the best plan for improvement of the Columbia River in the combined interest of navigation, flood control, power development and irrigation.

At the Bonneville site the river is divided into two channels by Bradford Island, which is more than a mile long. About 800 ft. upstream from Bradford Island is another small island known as Boat Rock. The preliminary layout for this site submitted by the Corps of Engineers with its report to Congress called for a spillway section of the dam across the main channel between Boat Rock and the Washington shore, a non-overflow dam of the Ambursen type between Boat Rock and the head of Bradford Island, and a power house extending across the secondary south channel near the foot of Bradford Island. Soon after the submission of the preliminary plans to Congress, the PWA, seeking projects that would create employment in the Portland area, picked upon Bonneville Dam as a desirable undertaking and, late in September of last year allotted $250,000 to the Corps of Engineers for further exploration and preparation of detailed plans. Only a week later an additional allotment of $20,000,000 was made to start construction of the project.

Confident that the preliminary plans were sound and that more detailed exploration of the underground conditions would not result in more than minor changes in location of major structures, or more than minor changes in their form, and having in mind the urgency of relief for unemployment, the Army Engineers began construction work within

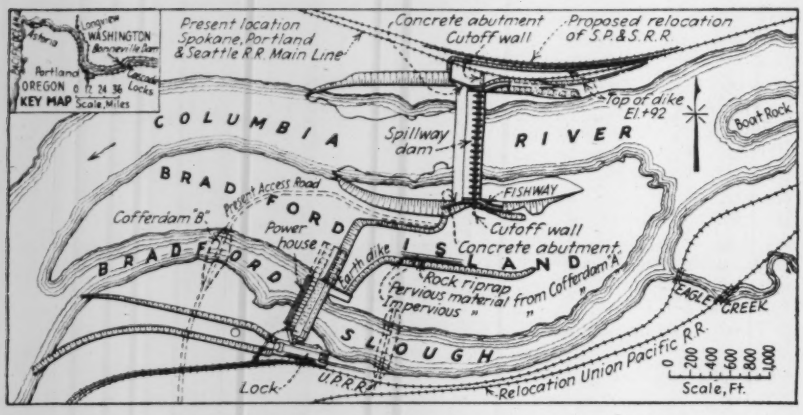


FIG. 2—THE SPILLWAY DAM at Bonneville is being built across the main channel, and the power house and navigation lock are under construction in the Bradford Slough. An earth dike across the island connects the two structures.

two months after the first allocation of money was made. The first contracts let were for railroad relocation on the Oregon shore and excavation for the non-overflow section of the dam between Boat Rock and Bradford Island. Soon afterward a contract for the powerhouse excavation was made.

More detailed study of the site as work progressed has shown the locations chosen for the power house and locks to be satisfactory, but that a considerable saving in cost and better hydraulic results can be secured by moving the spillway section of the dam about 3,000 ft. downstream. Plans were changed accordingly, as shown on the accompanying map, and recently contracts for both the dam and power house were let.

Columbia River flow

The seasonal flow cycle of the Columbia River at Bonneville is fairly regular; summer floods normally are sustained flows lasting as much as 100 days. Above the site is a 1,000-mile length of the river from the United States into Canada and return, including large lakes such as Coeur d'Alene, Pend d'Oreille, Chelan, Okanogan, Kootenay and others which regulate and stabilize the flow. Under these conditions any ordinary reservoir capacity at Bonneville would have little effect, nor is storage important where such large flows as 70,000 sec.-ft. are ordinarily available even at low water. Thus a relatively low dam, creating little storage capacity, was planned.

The natural fall of the river from the head of Cascade Rapids to the Bonneville power house, 4 miles below, is about 35 ft. Water level will not be raised enough to disturb cities in the valley above, but it will be raised sufficiently to use the available head between Bonneville and The Dalles, some 50 miles upstream, which is the next power site. The ten sites are as follows, in the order of progress upstream:

1. Bonneville (under construction)
2. The Dalles
3. John Day Rapids
4. Umatilla Rapids
5. Priest Rapids
6. Rock Island (constructed in 19[illegible])
7. Rocky Reach
8. Chelan
9. Foster Creek
10. Grand Coulee (under construction)

At these sites about 90 per cent of the head can be developed between tidewater and the Canadian line, according to the army engineer report. The total power available is about 8,000,000 kw. and the total development cost, if interest during construction is figured at 6 per cent, is estimated at $770,000,000.

At Bonneville the estimated cost of the dam and two units in the power house with substructure for four more is estimated at $31,250,000, of which $20,250,000 was allotted for immediate work in September, 1933, and $11,000,000 more on Aug. 3, 1934.

Studies of the dam site

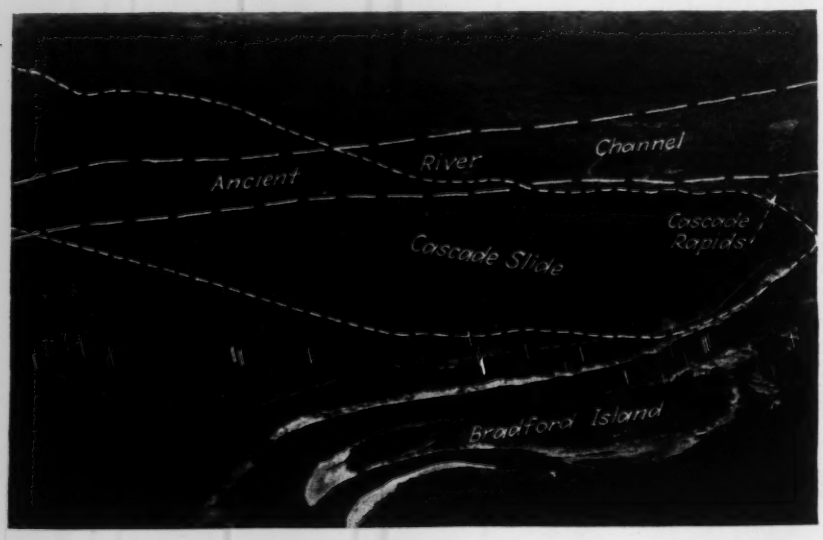
Having determined that the site of the first of these power developments on the Columbia River should be located so as to take advantage of the water drop at Cascade Rapids and through the gorge below, analyses and cost estimates were made for three sites ranging from the immediate vicinity of the locks to a point 7½ miles downstream. Important elements in these analysis were: (1) foundations, (2) river diversion during construction, (3) suitable power-house site with ample capacity of tailwater channel, and (4) means for handling safely, over the main spillway, the very large floodflows of the Columbia River.

Early in these studies it was recognized that the enormous slide on the north side of the river at this point—known as the Cascade Slide—had caused changes in level and location of the channel which are the principal reasons why there is a power site at this point. The slide probably occurred about 1,000 years ago, after the river had cut a deep gorge—some 200 ft. or more deeper than the present channel—close to the bluffs of the Washington bank. This cutting is thought to have caused the great landslide that swept across the valley just below Cascade Locks and dammed the river.

The landslide dam formed a lake in which the water level rose until it overflowed the slide and established the present river channel as a detour around the south end of the slide along the Oregon shore. To get around the slide in this way, the river made a right-angle turn where the ancient channel was blocked, and at that point turned sharply from a westerly to a southerly course, overflowing its former left bank at what is now known as the head of Cascade Rapids. Borings in these rapids show the characteristic rock formation at

FIG. 3—A GREAT LANDSLIDE in prehistoric times filled the ancient river channel and forced the river to rise and flow out of its old channel at what is now known as Cascade Rapids.

Brubaker Aerial Surveys.



riverbed, while borings in the river channel both above and below the Cascade landslide to depths of 200 ft. penetrate only river sand and gravel, supporting the theory of the greater depth in the ancient gorge.

The lower portion of Cascade Slide is thought to have been inactive for many hundreds (perhaps thousands) of years; a railroad and a state highway closely follow the water's edge around the north shore of the river's present channel, as do a similar pair of transportation facilities on the south bank. The slide is now so stable that it is considered a factor in the Bonneville project only in so far as its history helps in finding foundations for concrete structures in the river's present channel.

Extensive core borings in the present channel located a ridge of bedrock in the section to the north of Bradford Island, which slopes down toward the ancient gorge. This ridge is a tuffaceous rock of moderate strength known as Eagle Creek formation. It affords a safe location for the spillway dam and a less expensive one than the other sites studied because rock is much nearer the surface on the ridge than elsewhere in the present channel.

Similar studies confirmed the earlier decision that the most advantageous site for the power house was some distance downstream from the spillway dam and on the opposite side of Bradford Island.

The spillway dam

Three major considerations were before the designers in preparing plans for the spillway dam, namely: (1) adequate spillway capacity, (2) a safe foundation and (3) a plan for diverting streamflow during the construction period, which would be effective in handling large floods. These requirements were met in a straight gravity dam that will be 1,250 ft. long overall, with a spillway crest length of 900 ft. The base width will be 180 ft., and the height above lowest foundation 170 ft..

Providing for the large floods that will pass over the spillway in years of heavy runoff requires some form of bucket or other device at the downstream toe to absorb as much as 2,800,000 hp. in energy of falling water. Also the large flood requirements have direct bearing on the type of spillway control that can be used effectively at low flows without interfering with free passage of maximum flood.

The details of the spillway toe bucket design have not finally been decided upon, but hydraulic analysis and model tests already made indicate that it will take the form of an ogee crest reversing onto a flat deck at about 40 ft. below ordinary low tailwater. This deck is to be provided with dentated baffle sills to dissipate energy through turbulence and to redirect the high bottom velocity of the spillway toward the surface and into a normal distribution for river flow.

Openings between piers in the spillway will be closed by eighteen vertical-lift gates, 50 ft. square, operating on enclosed roller-bearing wheels for which a design new to gates of this size is being developed.

The lift gates, of horizontal framed, riveted or welded steel construction, will weigh 200 tons each, and each will be operated by either of two gantry cranes. In open position the gates will be held on dogs in their respective slots, beneath which the clear opening will be sufficient to pass a flood of more than 1,600,000 sec.-ft.

This maximum flood is one-third larger than that of June 6, 1894 (1,170,000 sec.-ft.), which was the greatest flow of the river in the 55-year period during which records have been kept at this point. During this period the range in flow has been from this maximum down to a minimum of 40,000 sec.-ft. (Jan. 30, 1930); the maximum annual mean flow was 331,800 sec.-ft., the minimum annual mean was 128,000, and the 55-year mean flow was 211,000 sec.-ft.

The second design problem is to make adequate preparation in the relatively soft rock foundation for safely supporting the structure. The foundation rock is a gray-blue deposit of volcanic ash and rock fragments, solidified by pressure of overlying lava. It is not highly resistant to shear or scour, and tests show its strength in compression to range from 800 to 2,000 lb. per sq.in. Accordingly, the dam has been designed to load the foundation not to exceed 110 lb. per sq.in. Interlocking the concrete and the foundation rock with steps gives an estimated safety factor in horizontal shear of 12. Foundation rock is to be protected by a heavily reinforced concrete apron 5 ft. thick extending 100 ft. downstream from the toe.

The plan adopted for unwatering the spillway dam site contemplates dividing the river channel into halves, unwatering each half successively by a large cofferdam formed by timber cribs floated to place, sunk in the required locations and then filled with rock. Steel sheet-piling is to be used as a facing on the cribs, to prevent inflow in the deeper portion of the channel where impervious

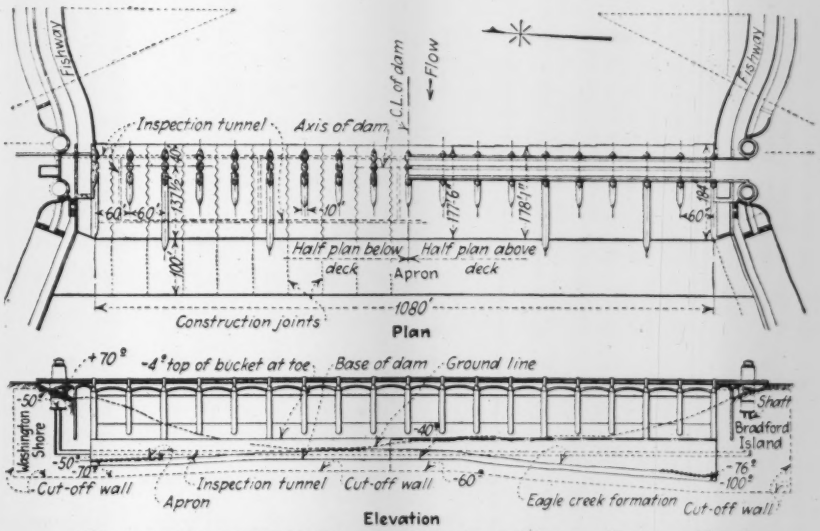
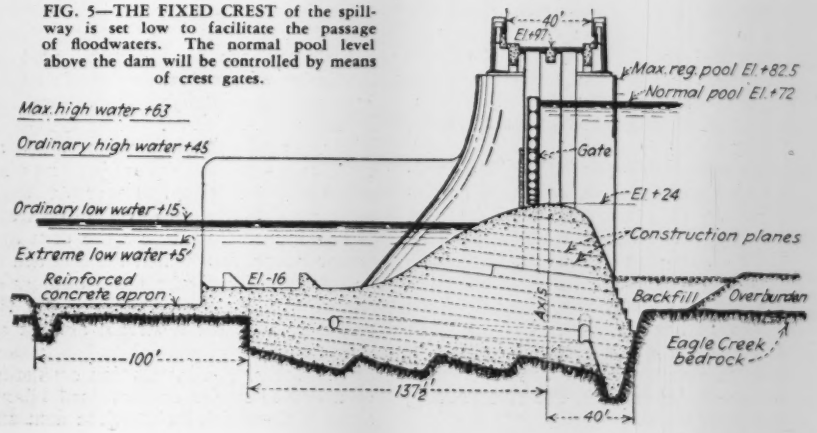


FIG. 4—LARGE FLOODFLOWS in the Columbia call for a spillway capable of passing a flood of 1,600,000 sec.-ft.

FIG. 5—THE FIXED CREST of the spillway is set low to facilitate the passage of floodwaters. The normal pool level above the dam will be controlled by means of crest gates.



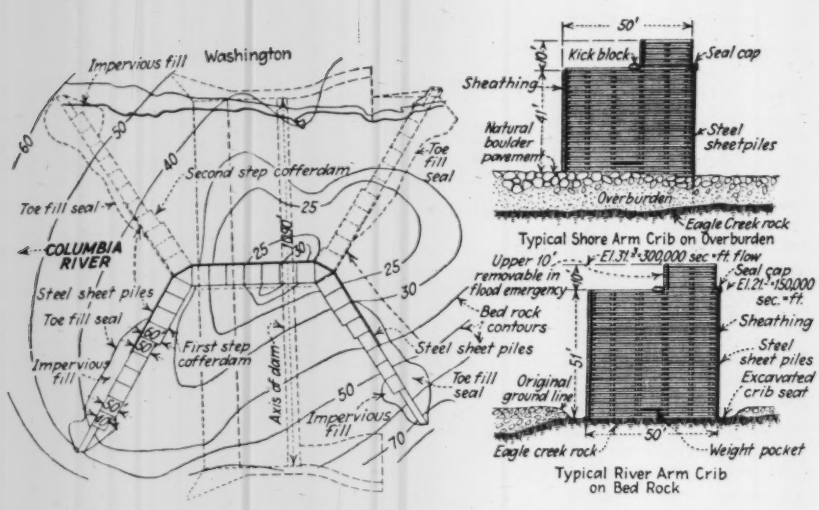


FIG. 6—TIMBER-CRIB COFFERDAMS of unusual size are to be used in the main river channel.

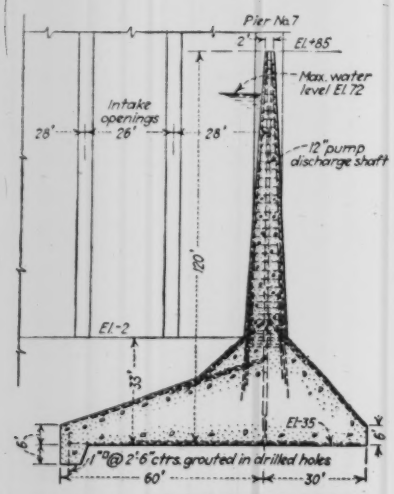


FIG. 7 — A REINFORCED-CONCRETE retaining wall 120 ft. high is to be built at the end of the present power house to facilitate future extension of the building.

banking cannot be maintained on the outside. As shown in the accompanying drawing, each cofferdam is to be formed by three lines of cribbing, the one in midstream (the river arm) will be parallel to the direction of flow, and the others (the shore arms) will be diagonal thereto. The line of cribbing in midstream will serve both cofferdams successively.

The cribs will vary in height according to location; each crib will be designed to fit requirements of its site. The largest river-arm cribs will be 60x60 ft. in plan and 61 ft. high. The shore-arm cribs will be of similar design but of smaller size, ranging down to 40x60 ft. in plan, with the top 10 ft. arranged for quick removal in case it becomes necessary during construction to leave these cribs in the river during a summer flood.

The cribs are to be built part height on shore, and wall timbers at the base will be 12x12 in. in section. Four pockets in each crib will be floored to receive rockfill ballast for balancing and sinking. The remaining pockets will be floorless, fill being placed in direct contact with the foundation.

The average working season on the Columbia is limited by floods to the eight-month period from August to March, inclusive. During the working season of 1935-36 the south half of the cofferdam is to be completed and unwatered, and concrete of the dam is to be poured in the piers up to full height and up to El. —5 in the sills between piers. The two south shore arms are then to be removed, and water will flow over sills on the south half of the dam. At the start of the 1936-37 season, shore arms to connect the river arm with the north bank will be built. After foundation work in the north half has been finished, final closure of the diversion slots will be made individually by lowering the permanent gates through guides extended to the bottom of these slots. Each slot then will be concreted to full height within a separate cofferdam.

Fishways

Fishways are an important part of the design of the dam and power house because of the extensive salmon-packing industry on the river. (The Columbia River annual salmon pack is valued at eight to ten million dollars.) The plan proposed for passing fish over the structures consists of a set of collecting traps placed immediately below the dam and power house, into which the fish are to be attracted by a substantial outflow of water. Within the collecting traps the fish are to be led upstream against an attractive flow of water into fish ladders or fish locks. An installation consisting of a double ladder on Bradford Island, a set of three fish locks at the dam and one at the power house is contemplated. The fish ladders will be of the conventional type, with pools 30 ft. wide, 16 ft. long and a fall of 1 ft.

The proposed fish lock is similar in principle to a navigation lock and operates on the intermittent plan—i.e., at intervals variable to suit the size of the run the passageway through which fish enter the lock is closed and the water level within is raised until the fish can enter the canal above. A grillage or false floor in the lock is raised as the water level rises, and if the salmon do not swim on upstream of their own accord they are dumped into the canal by the rising grillage. The rate of operating the lock can be varied as required with a limiting minimum of about 15 min. for the complete cycle. Each lock is designed to handle about 100,000 fish per day during the peak of the runs.

Spillage incidental to releasing water after fish have left the lift chamber is via a separate wasteway and hence causes no surge or disturbance in the fishway. Quantity of flow through the fishway leading into the lock chamber is maintained at a constant rate of about 1,500 sec.-ft. regardless of whether the lock is filling or discharging. This quantity of flow will issue from the fishway at either end of the dam, the two installations being duplicates, except that two lifts are provided at the Washington end of the dam and one lift and a ladder at the Bradford Island end.

Power-house design

The ultimate power-plant capacity is to be 430,000 kw. made up of ten 43,000-kw. units, of which two are to be installed now with foundations and skeleton structure constructed for four more to be added later. Three features of note in the power-house design are: (1) the very large generating units with correspondingly heavy overhead cranes, (2) a 120-ft. retaining wall at one end of the power house, made desirable by plans for future extension; and (3) the design of the intake floor, which increases the stability of the intake structure by carrying the water load to the pier foundation.

The power-house structure is to act as a dam across Bradford channel of the Columbia—i.e., between Bradford Island and the Oregon shore, at a point where the width is only about 500 ft. Hence the six units spaced on 82-ft. centers are sufficient to close the channel completely. The exact power-house location was determined by a basalt sill which diamond drilling showed crossing this channel under a considerable amount of overburden. It was found that the power house could be placed on this sill economically with a convenient tailrace location. Just downstream from the basalt sill there is a deep pool which will permit draft-tube discharge into water about 100 ft. deep. Also, a power house in this location adjoins a basalt formation along the Oregon shore

suitable for supporting the navigation lock.

The basalt, which is an intrusion in the Eagle Creek formation, ends just beyond unit 9 (units being numbered from the Oregon side toward the island). Beyond this point the surface of the Eagle Creek formation lies at El. —70. Under these conditions, to reach rock foundation in the extension, assuming normal streamflow, there will be a difference in level of 142 ft. between the lowest excavation and water surface in the reservoir directly above.

The power house is designed so that the four additional units can be added at some later date without interruption of service from completed units. Later extension of the power house will be facilitated by a reinforced-concrete cantilever wing wall 120 ft. high, designed to act as part of a future cofferdam for unwatering footings in the power-house extension. This wall is T-shaped, rests on basalt rock (at El. —35) and will depend partly on water load for stability. It will extend from the intake piers 140 ft. upstream into the end of the earthfill that connects the power house with the spillway dam. This type of construction was adopted because, when the power house is extended, the slender upright stem of the wall, 12 ft. thick at the base and 3 ft. at the top, lines up with an intake pier so closely that it may be left in place permanently, thus avoiding the cost of underwater removal. The wall will be heavily reinforced to withstand unbalanced hydraulic load, and uplift will be prevented by a system of drains leading to a central sump from which seepage will be removed by pumping.

With the spillway dam effectively closing the main channel and the power-house structure, and the adjoining retaining wall similarly shutting off the Bradford channel, there remains the question of preventing subterranean flow or seepage through the island itself. Just what will be required depends upon how tight the formation in the island, which now is being explored by sinking test pits, proves to be. A concrete curtain wall from power house to spillway dam would cost about $1,000,000. Other plans that have been considered are the sealing of pervious strata if they are found by forcing down fine sand or clay in vertical pipes under high pressure; or using chemicals in a pressure-grouting process that would combine on admixture underground in such a way as to seal any strata porous enough to admit the chemicals.

TABLE I—BONNEVILLE POWER OUTPUT AT VARIOUS RIVER STAGES

Gross Head, Ft.	Corresponding Flow, Sec.-Ft.	Per Cent of Time This Flow Exceeded	Output per Turbine, Hp.	Output per Generator, Kw.	Water Quantity per Unit, Sec.-Ft.
35	950,000	0.1	38,250	28,100	11,470
45	550,000	5.6	53,000	38,700	12,330
50	286,000	22.5	60,000	43,860	12,420
55	150,000	47.5	60,000	43,860	10,600
65	40,000	100	60,000	43,860	9,000

The power-house intake structure will include three 21x43-ft. gate openings for each unit. Gates will be of structural steel; seal will be effected with rubber strips bearing against stainless-steel rubbing plates except on the bottom, where a sealing plate will rest on the steel sill. Two sets of grooves will be provided in each bay, and any gate will be interchangeable with any other; transfers will be made by the gantry on the intake deck.

The concrete slabs between piers are designed to carry the water load and to transfer it to the piers themselves. This is accomplished by raising the slabs above the rock foundation so that they can deflect downward enough to function as floor slabs and thus transfer load to the piers. Space under the slabs is drained to prevent uplift. In this way a water load is added to the piers which will be effective in resisting overturning moment. Additional concrete to provide an equivalent resistance to overturning would have cost about $20,000 per unit.

The turbines will be of the Kaplan type designed for 60,000 hp., with blades automatically adjustable for variations in head and load; the efficiency is to be maintained at nearly 90 per cent from one-quarter to full load. Although a head of 56.0 ft. will be available about 50 per cent of the time, extreme variations may cause it to range from 20 to 70 ft., thus making the adjustable type runners particularly desirable.

At 49-ft. head each turbine can develop full power, using 12,420 sec.-ft. Ten units would use 124,200 sec.-ft., and when the flow exceeds 250,000 sec.-ft. more than half the water must be wasted; hence water economy is of no consequence. Headwater can be regulated so that less than 49 ft. of head will exist only 6 per cent of the time, or when the flow exceeds 500,000 sec.-ft.

Tests on model draft tubes and scroll cases (6-in. throat diameters) are being carried on to determine the most efficient types. Later, tests with 16-in. models are to be made at the Holtwood, Pa., laboratory before final design is determined.

Navigation lock

The Columbia River is navigable for small boats of shallow draft up past the Bonneville site as far as The Dalles, but the traffic in recent years has been negligible on account of the small size of the locks. The army engineers' plans for the Bonneville development called for a barge lock 76x360 ft. adjoining the power house with a depth of 10 ft. on the sill at extreme low water and 15 ft. at ordinary low water. Up-river interests, however, wanted a 76x550-ft. ship lock with a sill depth of 30 ft. In recognition of this situation, Col. T. M. Robins, division engineer at Portland, recently recommended a change in plans to permit construction at this time of a ship lock 76 ft. wide, 500 ft. long and with a depth on the sill of 27 ft. at ordinary low water. In his report Colonel Robins said: "The cost of enlarging the barge lock now into a single-lift ship lock is estimated at $1,200,000. The cost of converting the barge lock into ship locks at some future time is estimated at $3,100,000." Colonel Robins, however, recommended against constructing a ship channel in the Columbia as far as The Dalles until more demand for river transportation developed. On Aug. 17, 1934, the construction of a ship lock of the dimensions recommended was authorized.

Design of the lock as originally proposed was changed from a tandem or flight lock to a single high-lift lock when it was found that the rock sill at the site was sufficient in extent to support either a barge or ship lock of this type. The single-lift design represents a saving of about $2,000,000 in the case of the ship lock. For a river flow of 100,000 sec.-ft., which is assumed to represent a typical average quantity, the

FIG. 8—THE NAVIGATION LOCK is to be built with a chamber sufficiently large for ocean-going vessels but will not be fully completed for that service at present.

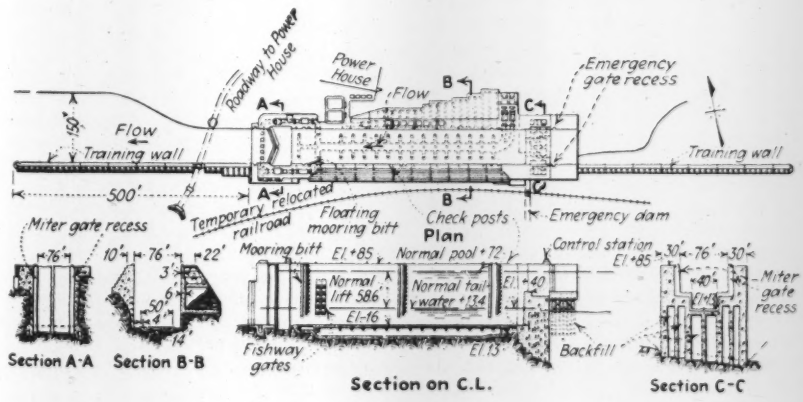


TABLE II—ESTIMATED MAJOR QUANTITIES

Common excavation, cu. yd	4,317,000
Rock excavation, cu. yd	1,967,000
Fill in cofferdams, cu. yd	330,500
Other fill, cu. yd	1,800,000
Concrete, cu. yd	871,000
Struct. steel and castings, tons	8,740
Reinforcing steel, tons	19,450
Rails, tons	1,650

ORIGINAL ESTIMATES OF COST

Investigations, surveys and designs	$300,000
Construction roads and bridges	100,000
Buildings and grounds	250,000
Barge lock and approach channel	1,750,000
Power-plant structure	5,000,000
Power-plant machinery and equipment	3,500,000
Main spillway dam	10,000,000
Railroad changes	4,500,000
Highway changes	500,000
Levees and revetment	500,000
Fishways	800,000
Land and flowage damage	2,900,000
Miscellaneous	1,000,000
	$31,000,000

TABLE III—CONTRACTS AWARDED PRIOR TO SEPT. 17 FOR AMOUNTS IN EXCESS OF $250,000

Date of Award	Work Contracted	Contractor	Amount	Date Scheduled for Completion
May 29, 1934	Spillway dam	Columbia Construction Co., Reno, Nev.	$8,972,650	Dec. 31, 1937
Feb. 6, 1934	Excavation for locks and power house	Guy F. Atkinson Co., San Francisco	1,173,390	Oct. 2, 1934
July 18, 1934	Masonry in lock and power-house substructure	General Construction Co., Seattle, and J. F. Shea Co. Inc., Portland	3,895,592	Aug. 7, 1935
May 29, 1934	300,000 bbl. cement	Oregon Portland Cement Co. and Beaver Cement Co.	606,000	.....
June 9, 1934	Relocation S.P.&S. Ry.	P. L. Crooks Co., Portland	339,395	Jan. 14, 1935

lift in the lock will be 58½ ft. The maximum lift will be 66 ft. at low water; at ordinary high water the lift will be 45 ft.

The lock gates at the lower end are 102 ft. high, necessitating design to transmit hydraulic thrust of about 15,000,000 lb. in each leaf of the gate through the gate hinges. Because the rock formation is of insufficient height to take this thrust at the downstream gates, a concrete block or gravity abutment will be put in to take this load. The gates will be built of silicon steel; air chambers will be used in the lower gates to lessen the dead load somewhat.

It was desirable that the emergency dam should be of a type that could be built within a minimum of lock length. The design selected is a series of horizontal truss bulkheads of 80-ft. span operating in grooves with rollers on two faces of groove contacts. These bulkheads are handled from a post derrick with the aid of a spreader 80 ft. long. The emergency dam, in effect, will consist of a series of thirteen 3.75x80-ft. units, each made up of two horizontal trusses with steel facing between. These units, built of nickel steel, will weigh 20 tons each. Mooring hooks in the lock will be of the floating type with rollers engaging vertical grooves.

Railroad and highway relocation

A railroad and a highway on each side of the river require some relocation to bring them above reservoir level. The length of track actually on a new route will amount to only 4.8 miles on the Washington shore (Spokane, Portland and Seattle Railroad) and 4 miles on the Oregon shore (Oregon-Washington Railroad & Navigation Co.). While these line changes are relatively short, the work is extremely heavy and grade changes up to a maximum raise of about 6 ft. will extend over 15 to 20 miles of the O. W. Railroad & Navigation Co.'s line. Work on the S.P.&S. is now under way, and the portion to be relocated will be completed by the end of 1934.

On the Oregon shore a serious problem is stable railroad location through an ancient geological slide a short distance above Bonneville that has given the railroad much trouble. Numerous drainage tunnels that were driven into this slide in the past in an endeavor to stop its movement proved very effective, but now the slide is receiving careful attention to avoid complications when water in the reservoir is raised to the higher level. The slide area is about 1½ miles in length and about 3,000 ft. wide at its extreme. It has a relatively flat slope, and the cause of the movement is ascribed to an underlying lubricating plane, fed by water held above a deposit of impervious Eagle Creek formation.

The proposed treatment consists of stripping the rock foundation near the river shore line, placing thereon a heavy rock toewall, and driving additional drainage tunnels above the proposed pool level. The new railroad grade is located with a minimum freeboard of 7½ ft. above maximum water level. These drainage tunnels will be at a level such that outlets located just above the normal pool level will be submerged only at high reservoir stages. (Such stages will be rare and of short duration.) The tunnels will be driven on a 0.5 grade, will be timbered temporarily and will later be replaced by perforated corrugated pipe. Supplemental treatment of the slide will be by riprap protection for resisting erosion, placed where weight will aid stability.

A contract for a portion of the reconstruction of the S.P.&S. Railway was let in June at a cost of about $500,000. Contract for a portion of the O.W.R.R. &N. work was let in September at $846,247. The total estimated cost of the railway and highway work will exceed $5,000,000.

Construction period

The expected construction period is three years, with power-plant operation scheduled for December, 1937. Estimates of principal quantities announced by the office of the district engineer are as shown in Table II.

A contract for excavation work at the site originally selected for the main dam was let late last year to The General Construction Co., Seattle, for $668,500, but work upon it was stopped by the December floods and was not resumed this year due to the changes made in the location of the dam. The active contracts are given in Table III.

Personnel

The Bonneville project is being constructed by the Corps of Engineers, U. S. Army, under Maj. Gen. E. M. Markham, Chief of Engineers. The staff at Portland consists of Col. T. M. Robins, division engineer; Major C. F. Williams, district engineer; Capt. H. A. Skerry, executive officer, and C. I. Grimm, chief civilian engineer. Heads of departments in the work of design are as follows: railroad and highway relocation, A. E. McKennett; spillway dam, H. G. Gerdes; power house, B. E. Torpen; navigation lock, Ray E. Mackenzie. Lieut J. S. Gorlinski is resident engineer, and G. E. Goodwin is administrative engineer at Bonneville.

Pump-Testing Program for the Colorado River Aqueduct

A SERIES OF TESTS now under way at the California Institute of Technology in Pasadena will develop information which will increase the efficiency of pumps for the five pumping stations to be built on the aqueduct from the Colorado River to Los Angeles. Individual pump capacities of 200 sec.-ft. are being considered for the total aqueduct capacity of 1,500 sec-ft. The maximum head, a single pumping lift, will be 440 ft., and the aggregate lift of the five stations will be about 1,590 ft.

An improvement of 1 per cent in pump efficiency is estimated to be the equivalent of a savings of $50,000 per annum in pumping costs. Because of this premium on high efficiencies, the Metropolitan Water District of Los Angeles has budgeted $88,000 for the laboratory tests, has built specially designed equipment and is making an exhaustive study of pump models under joint supervision of institute staff and engineers of the district.

The pumps being tested are in model sizes—the size ratio is one to six—but they have the same peripheral speed and the same specific speed as those to be installed on the aqueduct. Pumps under test are driven by a 400-hp. electric dynamometer so balanced and controlled that energy supplied is measured automatically with great accuracy. Similarly, the water delivered under varying pressure heads is measured with devices designed to meet the unusually high precision requirements of these tests. The temperature of the water pumped is maintained constant.

Earthquake and Wind Design: Suggested Rationalization

Present practice of ignoring building walls and slabs contrary to common sense—Simple analysis possible which takes them into account and recognizes dynamic character of forces

By Jacob J. Creskoff
Consulting Engineer, Philadelphia, Pa.

IN ANY of the conventional methods of building-bent analysis, be it one of the "precise methods" such as the slope-deflection[1], or Spurr's method[2], or one of the "approximate methods" such as the cantilever or portal method[3], the frame only is investigated and consideration of the deflections is restricted to those induced in the frame by the assumed horizontal loading. A building, however, resembles its frame only remotely. Also, there is no simple relationship and indeed little similarity between the deflection of a building and that of its frame, for the reasons that the deflections of the horizontal members of the frame are limited by the slabs, and those of the vertical members are modified by the walls.

In the following discussion the term *frame* refers to the structural skeleton and the term *building* denotes the composite structure formed by the frame, floor and roof slabs, hereafter referred to as *slabs*, and walls and partitions, hereafter referred to as *walls*. The term *floor* denotes the composite structure formed by the horizontal framing and the slab.

Importance of slabs and walls

How important the restraining influence of the slabs and walls is in deciding the deflection behavior of a building can be realized from the following considerations: In a frame with known end conditions it is possible to compute its maximum deflection under a specified load, and this computed deflection will be found to check closely the actual measured deflection. However, if the dead and live loads representing correct conditions of usage are added to the frame, and its maximum deflection from a horizontal thrust computed and compared to the actual measured deflection of the building under the same thrust, it will be found that the measured deflection will be only a fractional part of the computed deflection. Clearly, the slabs and walls are acting in other ways than as just so much dead load.

Similar remarks apply to the calculation of the periods of vibration of a building. For example, the computed periods, if determined without taking into account the stiffening effects of the slabs and walls, will be found to be much greater than the actual measured periods of vibration.

In both cases, if the rigidity added by the slabs and walls is considered[4], the computed deflections and periods will check reasonably well with the measured deflections and periods of vibration of the structure.

Obviously, the slabs and walls influence the rigidity and strength of a building. Reports on earthquake and wind damage suffered by buildings that did not collapse uniformly agree that slabs and frames were damaged slightly or not at all, but that walls suffered considerable damage. The preponderance of data is to the effect that the slabs acted as stiff horizontal girders, that the walls were in full action while the columns were not heavily stressed, and that until the walls failed, they and not the columns bore the brunt of the horizontal thrust.

These facts are not new. They seem to be in agreement with common sense, for it is evident that a frame cannot begin to function as designed until the contiguous slabs and walls have failed. Nevertheless, in spite of the many experiences which show that the assumption does violence to physical facts, current practice continues to assume that slabs and walls play no part in resisting earthquake and wind forces. It would seem to be the part of good practice to design slabs and walls to take safely the loads thrust upon them by reason of their rigidity. If this is done, buildings will be more rigid and stronger and better able to withstand earthquake and wind undamaged, rather than surviving merely as frames carrying the wreckage of masonry.

Dynamic approach to design

When a building is deflected by earthquake or wind, the force causing that deflection may be estimated either by statical or dynamical methods. In general, the statical method assumes that buildings are vertical cantilevers subjected, in the case of earthquakes, to a static horizontal force equal to a percentage of the dead and live loads above the section under consideration. The percentage chosen for any case depends on the distance of the site from active faults and on the type of soil encountered. For wind, the statical method assumes a static horizontal force equal to a specified load per unit area of building elevation. The unit load chosen depends on the velocities of the prevailing winds of the locality and on the dimensions of the building.

The dynamical method, on the other hand, recognizes that earthquake and wind forces are not static. In common with the statical method, the proximity to faults and the type of soil are investigated, but, in addition, the dynamical method takes into account the influence of the site periods on the probable seismic motion; the effect of discontinuity between the site and the foundation on the seismic motion of the latter; the influence of the end conditions of the building on its probable deflection; and the effect of synchronism between building and earthquake periods, the latter being of profound importance in determining the locations and amounts of the maximum shears and moments.

For wind, the dynamical method considers the factors of prevailing winds and building dimensions, just as in the statical method. In addition, the influence of the end conditions of the building on its deflection, and the effect of synchronism between the building periods and those of the wind-gust increments are taken into account.

When a building is deflected by earthquake or wind, the force acts against the mass of the building. Assuming that the earthquake or wind force P and moment M have been determined by either the statical or the dynamical method; that the mass of the building is concentrated at its floor levels—which errs on the side of safety—and, considering the floors as horizontal girders that deflect as units, then the columns and walls between two consecutive floors may be regarded as vertical beams, deflecting equally by reason of a concentrated horizontal force P acting on the upper floor, and with end conditions determined by the *degree of fixity* between the vertical beams and the floors.

In the analysis which follows, the "vertical beams" are of structural steel and reinforced concrete. The analysis can, of course, be extended to include other materials, but only those that can take stress reversals will be found practicable.

Analysis of "vertical beams"

If tensile, compressive and shearing stresses exist simultaneously in an element of a beam, it is an experimental fact fundamental to the subject of elasticity that each stress produces its own strain and deflection just as if no other stress were present, the total deflection at any point being equal to the sum of the individual deflections due to the bending moment (tension and compression) and shear at the point.

For deflections within the elastic limit, the conventional theory of homo-

geneous, isotropic beams gives the deflection y_m due to moment of a structural-steel vertical beam, with a concentrated, static, horizontal force P acting at one end, as

$$y_m = \frac{CPL^3}{EI} \qquad (1)$$

where C = constant of deflection depending on the degree of fixity between the vertical beam and the floor; L = clear span of the vertical beam; E = Young's modulus for steel; and I = moment of inertia of the section.

The maximum deflection y_s' due to shear of a structural steel I-section, loaded as above, is

$$y_s' = \frac{2.5\ PL}{EA_w} \qquad (2)$$

where A_w is the area of the web of the I-section.

But, in general, the steel vertical beams are fireproofed and are composite sections. Their actual deflection will be less than that computed by Eq. (2) and will approach the value for the shear deflection of a rectangular steel section given by Eq. (3). Also, y_s' is small compared to y_m, so that a small error in y_s' will hardly be noticeable in the total deflection ($y_m + y_s'$). Therefore, for purposes of simplification, it will be assumed that for shear-deflection calculations steel sections are rectangular.

The maximum deflection due to shear y_s of a steel rectangular section, loaded as before, is

$$y_s = \frac{3\ PL}{EA} = \frac{3\ PLr^2}{EI} \qquad (3)$$

where A = area of the section; r = radius of gyration; and $I = Ar^2$.

The total maximum deflection Y of a steel vertical beam is ($y_m + y_s$), or

$$Y = \frac{PL(CL^2 + 3r^2)}{EI} \qquad (4)$$

The above considerations apply only to beams composed of homogeneous, isotropic materials that obey Hooke's law. However, reinforced concrete, which comprises the other element of the vertical beams, namely the walls, is neither homogeneous nor isotropic and although concrete in compression obeys Hooke's law, concrete in tension does not do so, except for very low stresses. Eqs. (1) to (4), therefore, do not apply, and it is necessary to use the Turneaure and Maurer formulas to calculate the moment deflections of reinforced-concrete beams. These formulas give results that check reasonably well with measured deflections under temporary loads and for a rectangular, vertical reinforced-concrete beam, loaded as before, may be stated as

$$D_m = \frac{CPL^3n}{Ebd^3K} \qquad (5)$$

$$K = \frac{k^3 + (1-k)^3 + 3np(1-k)^2}{3} \qquad (6)$$

$$k = \frac{1 + 2np}{2 + 2np} \qquad (7)$$

where D_m = maximum deflection due to moment; n = a constant (8 in the above formulas); E = Young's modulus for steel; b = width of beam; d = depth to center of tensile steel; K = coefficient depending on p and n; p = steel ratio; and k = proportionate depth of the neutral axis.

For a rectangular section, $I = bd^3/12$. Substituting 12 I for bd^3, and 8 for n, Eq. (5) reduces to

$$D_m = \frac{2CPL^3}{3EI\,K} \qquad (8)$$

Dividing Eq. (8) by Eq. (1),

$$D_m = \frac{y_m}{1.5\ K} \qquad (9)$$

That is to say, the maximum moment deflection of a steel beam, divided by a deflection factor ($1.5K$), gives the maximum moment deflection of a reinforced-concrete beam, which is identical in every respect, except for material, to the steel beam.

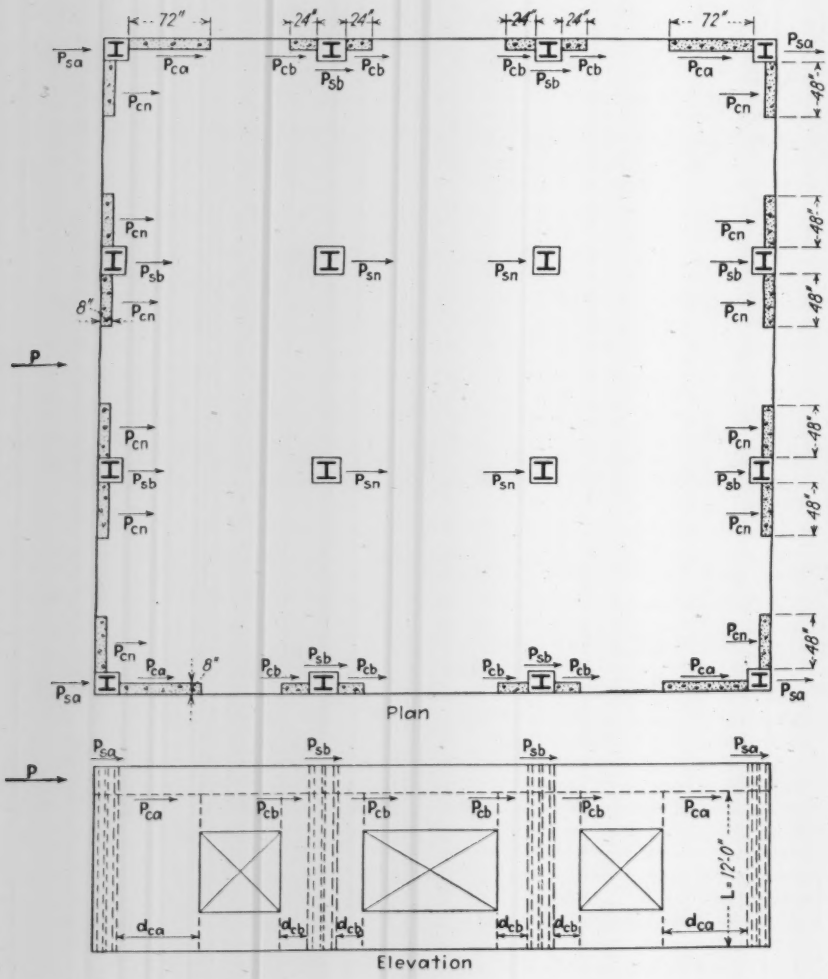
By analogy, therefore, the maximum shear deflection of a steel beam, divided by the deflection factor, gives the maximum shear deflection D_s of an otherwise identical reinforced-concrete beam, or dividing Eq. (3) by $1.5K$,

$$D_s = \frac{2PL}{EA\,K} = \frac{2PLr^2}{EI\,K} \qquad (10)$$

Comparing D_m to D_s, the effect of the ratio L/d on the values of the moment and shear deflections becomes apparent, for with $A = bd$ and $I = bd^3/12$:

$$D_m = 4C\frac{L^2}{d^2}D_s \qquad (11)$$

DIVISION of horizontal shear P among columns and vertical wall beams (composed of steel columns and reinforced-concrete walls) at a given story.



Eq. (11) shows that where L/d is large, as in the case of a beam of usual proportions, the shear deflection is negligible compared to the moment deflection. However, where L/d is small, as in the case of a wall, the shear deflection may be larger than the moment deflection. For example, assuming that $C = 1/12$, if $L/d = 10$, then $D_m = 33.3\ D_s$; but if $L/d = 1$, $D_m = 0.3\ D_s$.

The total maximum deflection D of a reinforced-concrete beam is $(D_m + D_s)$, and may be obtained directly by dividing Eq. (4) by the deflection factor, or

$$D = \frac{PL(CL^2 + 3r^2)}{1.5\,EI\,K} \qquad (12)$$

By letting $Z = (CL^2 + 3r^2)/I$ for the structural-steel beams, and $G = (CL^2 + 3r^2)/(1.5\ IK)$ for the reinforced-concrete beams, and, substituting in Eqs. (4) and (12), (the subscripts s and c denoting structural steel and reinforced concrete respectively),

$$Y = P_sLZ/E \qquad (13)$$

$$D = P_cLG/E \qquad (14)$$

Referring to the accompanying figure and remembering that by hypothesis, at the same elevation, $Y = D$, then

$$Y = \frac{P_{sa}LZ_a}{E} = \frac{P_{sb}LZ_b}{E} = \frac{P_{sn}LZ_n}{E} = D \qquad (15)$$

and

$$D = \frac{P_{ca}LG_a}{E} = \frac{P_{cb}LG_b}{E} = \frac{P_{cn}LG_n}{E} = Y \qquad (16)$$

So that

$$\frac{P_{sa}}{P_{sb}} = \frac{Z_b}{Z_a} = c_1 \qquad (17)$$

$$\frac{P_{sa}}{P_{sn}} = \frac{Z_n}{Z_a} = c_2 \qquad (18)$$

$$\frac{P_{sa}}{P_{ca}} = \frac{G_a}{Z_a} = c_3 \qquad (19)$$

$$\frac{P_{sa}}{P_{cb}} = \frac{G_b}{Z_a} = c_4 \qquad (20)$$

and,

$$\frac{P_{sa}}{P_{cn}} = \frac{G_n}{Z_a} = c_5 \qquad (21)$$

$$P_{sb} = \frac{P_{sa}}{c_1}, \quad P_{sn} = \frac{P_{sa}}{c_2}, \quad P_{ca} = \frac{P_{sa}}{c_3}$$

$$P_{cb} = \frac{P_{sa}}{c_4}, \quad P_{cn} = \frac{P_{sa}}{c_5} \qquad (22)$$

Let n_1, n_2, n_3, n_4, n_5 and n_6 equal the number of similar beams. Then

$$P = n_1P_{sa} + n_2P_{sb} + n_3P_{sn} + n_4P_{ca} + n_5P_{cb} + n_6P_{cn} \qquad (23)$$

Substituting the equivalents from Eq. (22) for P_{sb}, P_{sn}, P_{ca}, P_{cb} and P_{cn}, Eq. (23) becomes

$$P = n_1P_{sa} + \frac{n_2}{c_1}P_{sa} + \frac{n_3}{c_2}P_{sa} + \frac{n_4}{c_3}P_{sa} + \frac{n_5}{c_4}P_{sa} + \frac{n_6}{c_5}P_{sa} \qquad (24)$$

and

$$P_{sa} = \frac{P}{\left(n_1 + \frac{n_2}{c_1} + \frac{n_3}{c_2} + \frac{n_4}{c_3} + \frac{n_5}{c_4} + \frac{n_6}{c_5}\right)} \qquad (25)$$

With P_{sa} known, P_{sb}, P_{sn}, P_{ca}, P_{cb}, and P_{cn} are found by Eq. (22).

Since the moment M taken by the vertical beams at any floor is proportional to the external shear P, it follows that

$$M_{sa} = \frac{M}{\left(n_1 + \frac{n_2}{c_1} + \frac{n_3}{c_2} + \frac{n_4}{c_3} + \frac{n_5}{c_4} + \frac{n_6}{c_5}\right)} \qquad (26)$$

and

$$M_{sb} = \frac{M_{sa}}{c_1}, \quad M_{sn} = \frac{M_{sa}}{c_2}, \quad M_{ca} = \frac{M_{sa}}{c_3},$$

$$M_{cb} = \frac{M_{sa}}{c_4}, \quad M_{cn} = \frac{M_{sa}}{c_5}. \qquad (27)$$

It will be found that the largest unit stresses will occur in the vertical beams that are most rigid in the plane of bending; and if the unit stresses in these beams do not exceed the allowable stresses, the same will also be true of the stresses in the other vertical beams.

Reinf. Conc. Beams	n	b	d	A	I	IK	r^2	G
ca (8 × 72″)	4	8	70	560	228,700	21,980	409.0	0.0898
cb (8 × 24″)	8	8	22	176	7,110	683	40.4	1.80
cn (48 × 6″)	12	48	6	288	864	83	3.0	13.9

Steel Beams	n	A	r	r^2	I	Z
sa 14″ 100 #H	4	29.36	3.49	12.2	356.9	4.94
sb 14″ 84 #H	8	24.76	3.45	11.9	294.5	5.99
sn 14″ 168 #H	4	49.51	3.82	14.6	720.6	2.46

Special case

Modern buildings of all types are covered by the preceding discussion—i.e., both the usual skeleton-frame, curtain-wall, cinder-concrete-floor buildings, as well as the specially designed, monolithic, earthquake-proof type of structures. In the latter type, symmetry of plan, mass and rigidity, as well as monolithic construction, are objectives.[5] Floor systems are strong and rigid, slabs are of reinforced rock concrete, and walls are of reinforced rock concrete and designed as continuous vertical beams. In general, the building is so designed and constructed that it vibrates as a unit in earthquake and wind.

For this type of building it will be assumed that the vertical beams are fixed top and bottom. Since the assumption of fixity is permissible only if the I/L of the horizontal girder is ten or more times that of the vertical beam,[6] it therefore follows that there is no vertical beam whose I/L is greater than 1/10 that of the horizontal girder. For this case[7] C in Eq. (4) and (12) equals 1/12.

It has been objected that this assumption is unwarranted because there is no floor beam whose I/L is ten times that of the column. This objection is not a legitimate one and arises entirely from the fact that the building is being thought of as a frame. But in the earthquake-proof type of structure, the I/L of the horizontal girder is the I/L of the monolithic floor with a value easily in excess of ten times that of any vertical beam. The author is convinced that for this type the assumption of complete fixity is more nearly correct than any other assumption is likely to be.

Example

The building shown in the accompanying figure is of earthquake-proof type. It may be assumed, therefore, that $C = 1/12$. As calculated by the dynamical method, the seismic shear P and moment M transmitted to the vertical beams by a major earthquake are: $P = 200{,}000$ lb., and $M = 14{,}400{,}000$ in.-lb. It is required to determine what proportion of the shear and moment is taken by the vertical beams sa, sb, sn, ca, cb, cn. Data for the steel and reinforced-concrete beams are given in the following tabulations. $L = 144$ in., and $p = 0.007$.

By Eq. (17), $c_1 = 5.99/4.94 = 1.211$
By Eq. (18), $c_2 = 2.46/4.94 = 0.497$
By Eq. (19), $c_3 = 0.0898/4.94 = 0.01818$
By Eq. (20), $c_4 = 1.80/4.94 = 0.364$
By Eq. (21), $c_5 = 13.9/4.94 = 2.82$
By Eq. (25), $P_{sa} = 200{,}000$ lb./265. = 754 lb.
By Eq. (22), $P_{sb} = 622$ lb.
$P_{sn} = 1518$ lb.
$P_{ca} = 41{,}600$ lb.
$P_{cb} = 2070$ lb.
$P_{cn} = 267$ lb.
By Eq. (26), $M_{sa} = 54{,}300$ in.-lb.
By Eq. (27), $M_{sb} = 44{,}800$ in.-lb.
$M_{sn} = 109{,}300$ in.-lb.
$M_{ca} = 2{,}990{,}000$ in.-lb.
$M_{cb} = 149{,}200$ in.-lb.
$M_{cn} = 19{,}300$ in.-lb.

It is evident that the reinforced-concrete vertical beam ca is the most rigid in the plane of bending, P_{ca} being 41,600 lb., and M_{ca} being 2,990,000 in.-lb. Investigating the unit stresses in ca, assuming that $j = 7/8$, and that $k = 3/8$, the unit shearing stress v is

$$v = \frac{P_{ca}}{jbd} = \frac{41{,}600}{\frac{7}{8} \times 8 \times 70} = 85 \text{ lb. per sq.in.}$$

The unit tensile stress f_s is

$$f_s = \frac{M_{ca}}{pjbd^2} = \frac{2{,}990{,}000}{0.007 \times \frac{7}{8} \times 8 \times 70^2} = 12{,}400 \text{ lb. per sq.in.}$$

and the unit compressive stress f_c is

$$f_c = \frac{2M_s}{jkbd^2} = \frac{2 \times 2{,}990{,}000}{\frac{7}{8} \times \frac{3}{8} \times 8 \times 70^2} =$$

464 lb. per sq.in.

It is to be noted that the reinforced-concrete walls do most of the work in resisting the earthquake force, taking 93 per cent of the total shear and moment and permitting the columns to take only 7 per cent. This is in accord with observations on earthquake and wind damage to buildings, as has been stated. Thus, theory and practice seem to be in excellent agreement.

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[6]"Standards of Design for Concrete," U. S. Navy, p. 28.
[7]Ibid, pp. 30-33.

Hydrological Data From the Miami Conservancy District

Continuing observations on flood-control operations accumulate information on rainfall, runoff and river hydraulics which are summarized and presented to supplement existing material on the subject

By C. S. Bennett
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IN THE MAINTENANCE and supervisory operations necessary for the continued functioning of the flood-control works constructed several years ago by the Miami Conservancy District in southwestern Ohio, there is a natural accumulation of data pertaining to rainfall, streamflow, river hydraulics and related matters. In a sense, the works of the district constitute a large-scale hydraulic laboratory, the operation of which permits observations to be made which provide a valuable supplement to small-scale studies. The engineering personnel of the district has been collecting and analyzing data on various phases of hydrology and reservoir operation for thirteen years, and by arrangement with the Weather Bureau and the U.S.G.S., it has been possible to extend this material.

The purpose of this article is to outline some additional findings in this general field, expanding the data presented several years ago ("Hydraulic Studies and Operating Results on the Miami Flood-Control System," by C. H. Eiffert, chief engineer, *Trans.*, Am. Soc.C.E., Vol. 93, p. 1,583; and "Miami Flood Protection Works Tested by High Flood," by C. S. Bennett, engineer, *ENR*, April 11, 1929, p. 599). The studies are continuing on the determinations of roughness coefficients in river channels and concrete conduits, silt deposits in retarding basins and rainfall and runoff relations.

RAINFALL-RUNOFF DATA FOR STORMS ON CATCHMENT AREA ABOVE DAYTON, OHIO

Date	Average Rainfall, Inches	Total Runoff, Inches	Runoff Rainfall Ratio, Per Cent	Remarks
Mar. 23-27, 1913	9.60	8.76	91.0	
Mar. 28-29, 1924	2.06	1.16	56.0	Some rain on 5 of preceding 7 days.
June 8, 1924	2.22	1.73	78.0	Cloudburst in upper valley.
Sept. 12-13, 1925	3.20	0.04	1.2	Little rain preceding 24 days. Deficiency 3.48".
Nov. 12, 1925	1.43	0.66	46.0	Heavy rain on 7th. Excess 2.43".
Nov. 26-27, 1925	1.29	0.20	15.6	No rain preceding 9 days.
Apr. 7-8, 1926	1.23	0.84	68.0	Rain on 4 of preceding 6 days. Def. 0.38".
Sept. 22-26, 1926	2.08	0.39	18.7	Rainfall distributed over 5 days.
Jan. 18, 1927	1.98	1.36	68.7	Rain on 2 of preceding 7 days. Excess 9.35".
Mar. 19-21, 1927	3.44	2.31	67.0	Rain on 4 " " " " Excess 4.73".
May 18, 1927	2.05	0.61	29.8	Rain on 6 " " " " Excess 1.04".
Nov. 30, 1927	2.15	0.64	29.8	Rain on 5 " " " " Def. 1.12".
Dec. 13, 1927	1.24	0.64	51.6	Some rain on 3 preceding days. Excess 3.84".
Apr. 21-22, 1928	2.09	0.53	25.5	Slight rain on 5 of preceding 7 days. Excess 1.96".
June 3-6, 1928	2.86	0.46	16.1	Rain on 4 of 7 preceding days. Def. 6.29".
Feb. 25-26, 1929	1.80	2.05	114.0	Rain on 3 of 7 preceding days. Snow on ground! Ground frozen and thawed before storm.
June 27, 1932	3.18	0.34	10.7	No rain preceding 7 days. Def. 4.87".
Dec. 31, 1932	2.41	1.19	49.5	No rain preceding 5 days. Excess 1.60".
Mar. 20, 1933	2.05	0.82	40.0	Rain on 4 of preceding 7 days. Excess 3.51".
May 8-14, 1933	5.38	3.22	60.0	Rain on 6 days preceding 8th. Excess 3.55".
June 17, 1934	1.12	0.007	0.06	No rain preceding 9 days. Def. 9.47".

Note.—Excess and deficiency are for preceding 6 months.

Storm rainfall-runoff ratio

Following each major storm in the Miami Valley, a comparison has been made of the runoff resulting from the precipitation with the rainfall. The runoff was computed for Dayton (drainage area 2,525 sq.mi.), and rainfall data were obtained from the 22 stations in the drainage area and reduced to a mean for the catchment basin. Total runoff was obtained from hydrographs of the flow at Dayton, using as a base line the estimated graph of flow if the storm had not occurred. Runoff was reduced to inches to facilitate comparison with rainfall.

The accompanying table shows the results of these computations and notes on conditions at the time of each storm. Data on the 1913 storm, the largest of record, are given for comparison.

This table indicates the great variation possible in storm rainfall-runoff relations and should emphasize the fact that attempts to set up workable formulas for computing runoff from rainfall with any degree of exactness must be made cautiously. The extreme variations in runoff percentage from the storms of Sept. 12-13, 1925, and June 17, 1934, as compared with those from the storms of June 8, 1924, and Feb. 25-26, 1929, illustrate this point. It appears almost impossible to evaluate coefficients to fit the great variety of combinations of conditions that have occurred in the few years covered by this table.

Annual and seasonal runoff

Some years ago a compilation of rainfall and runoff data for the Miami Valley was published as a technical report of the district. The data relating to annual and seasonal rainfall-runoff relations were presented previously in a series of graphs that have now been extended to include 1933 and are reproduced as Figs. 1 and 2. This record now covers a period of 40 years, 1894 to 1933.

In the preparation of this material the "water year" ending Sept. 30 was used rather than the calendar year. All the runoff data are for the Dayton station. Rainfall data were secured by averaging the annual precipitation records at 14 to 17 stations in the drainage area, and runoff was calculated from the daily streamflow records, part of which were compiled by the U.S.G.S. The seasonal data were obtained similarly, using monthly records instead of annual figures. The division of the year into three seasons was made arbitrarily in a manner that seemed to fit local conditions. The months from October to December were designated the replenishing period, the months from January to April the storage period, and the

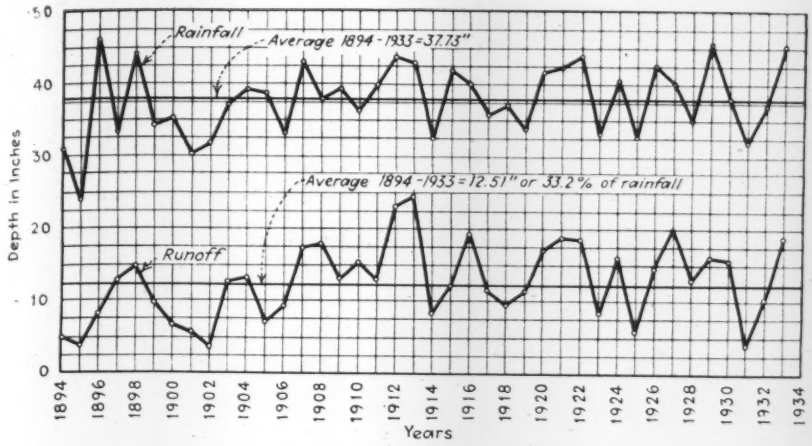


FIG. 1—FORTY-YEAR RECORD of annual rainfall and runoff above Dayton, showing departure of both from the average for the period.

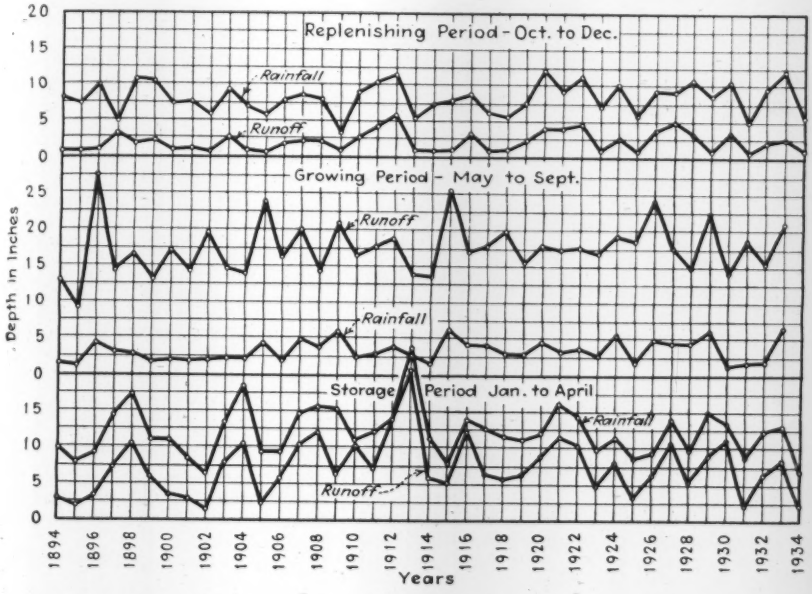


FIG. 2—SEASONAL RECORD of rainfall and runoff for the replenishing, growing and storage, indicating marked effect of vegetation on runoff during the growing season.

months from May to September the growing period.

A lack of cyclic variation in annual rainfall in the Miami Valley is clearly indicated by these graphs as well as a lack of uniform fluctuation of runoff with rainfall.

The segregation of data into seasonal groups—the storage, growing and replenishing periods—is particularly important in bringing out graphically the effect of growing vegetation and cultivation on runoff in a largely agricultural area. It also appears that in seasons of subnormal rainfall the runoff fluctuates much less than the rainfall during the growing period. Thus in the period 1898-1904 and again in 1917-1919 and 1930-1932 considerable fluctuation in the rainfall graph is accompanied by an almost level portion of the runoff graph. Study of these graphs indicates that annual runoff, and more particularly seasonal runoff, is influenced to a considerable degree by the distribution of the rainfall rather than by the amount.

Within the 40-year period included in the tabulation there has been a considerable development of the agricultural lands in the Miami Valley and an increase in farm drainage systems by means of tile or open drains, an increase in city areas and a notable extension in the areas of paved roads and streets. All of these are said to tend to increase runoff in relation to rainfall. However, a comparison of the ratio of mean annual runoff to rainfall for two ten-year periods does not disclose any great change in the rainfall-runoff relationship. For the period 1902-1911 the ratio of mean annual runoff to rainfall was 32.7 per cent, and for the period 1924-1933 the ratio was 33.7 per cent. The first ten years of the record were not used for this comparison because rainfall was abnormally low during most of the first decade.

During the period of 40 years the average annual rainfall on the drainage area above Dayton was 37.73 in., and the average annual runoff was 12.51 in. For the period 1919 to 1933, fifteen years, the averages were 38.84 in. and 13.59 in., respectively. It should not be assumed, however, that the annual rainfall and runoff have increased materially in the 40-year period.

Rainfall at adjacent stations

In few localities, except perhaps in the New England area, are rainfall stations as numerous as in the Miami Valley. Those who use rainfall data for the purpose of computing rainfall-runoff relations must rely on available data and must make some assumptions as to the distribution of rainfall over the area considered.

An attempt was made to determine the relation between the record at one station in a relatively small drainage area to a group of stations in that area. Monthly and annual precipitation records for a period of five years were used. The records at eleven stations above Dayton were averaged, and the mean values were plotted as percentages of the Dayton record. Fig. 3 shows the results of this investigation. While the difference between annual rainfall at Dayton and the mean annual of the eleven stations above varied only from +10 per cent to —4 per cent of Dayton annual, the monthly figures showed a great difference. This variation ranged from +265 to —55 per cent for individual months. As can be seen, there was no regularity in direction or amount of variation.

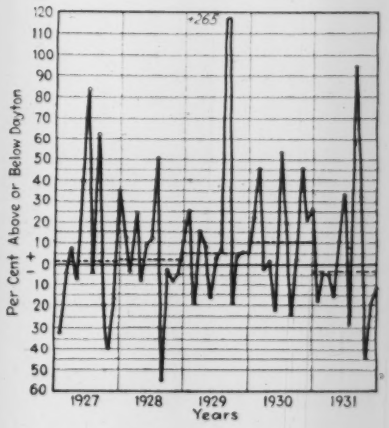


FIG. 3—RELATION of the average monthly rainfall record for eleven stations above Dayton to the monthly record at Dayton. Average percentage difference for the annual period is indicated by dotted lines.

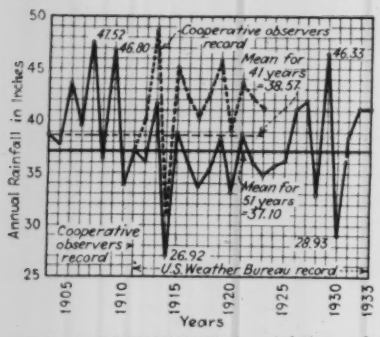


FIG. 4—DISCREPANCY in rainfall record which may result from change in location of station. The variation between the cooperative observers' record and the official record after the installation of the Weather Bureau station is clearly indicated.

This study indicates that in sections of the country similar in general characteristics to the Miami Valley rainfall records should be used with considerable judgment and due regard for great fluctuations in amounts at stations relatively close to each other. Individual storm records would no doubt show even greater variations.

Another illustration of the variation in rainfall catch at adjacent stations was discovered accidentally. Rainfall records were kept at Dayton from 1883 to 1923 at a cooperative observer's station near the eastern limits of the city. The rain gage was located on the ground with satisfactory exposure. In 1911 the Weather Bureau station was established in Dayton, with its instrumental equipment on top of a downtown building. A graph of the annual precipitation at Dayton for the entire period, 1883 to 1933, was prepared, using the cooperative record to 1911 and the Weather Bureau record for subsequent years. Since the cooperative observer's record was also published in *Climatological Data* until 1923, this record was transferred to the same graph, with the result shown in Fig. 4. The mean annual precipitation for the entire 51-year period, based on the composite of the cooperative observer's record and the Weather Bureau station record, is 37.10 in. But the mean annual figure for the 41 years of the cooperative observer's record, 1883 to 1923, is 38.57 in.

River channel "*n*" improved

The channel improvement of the Miami River at Hamilton was completed in 1922. The levees flanking the channel are for the most part lined with concrete revetment on the river side, with a flexible block revetment at the toes of the levees. The slope of the channel bottom is about 4 ft. per mile. During the period of ten years subsequent to completion of this work the channel was cross-sectioned every two years to determine the amount of filling. A gradual increase of deposited material was noted, and the total accretion up to 1932 in the 1½ miles of river channel was about 500,000 cu.yd. This material was removed during 1932 by dragline excavators, and the channel was restored to near its 1922 dimensions.

During each major rise of the stream careful readings were made of the surface-slope gages, and the discharge was measured at the same time. From this information Kutter's *n* was computed for several reaches of the improved channel. It is notable that in 1924-26 values of *n* computed for this channel ranged from .014 to .016, in 1930-32 the values were from .018 to .020, and in 1933, after the channel had been re-excavated and smoothed, the value of *n* was found to have decreased to .017 to .018.

These measurements were made when the depth of water averaged about 10 to 15 ft., average velocities were from 5.5 to 7.5 ft. per second, and average hydraulic radii were from 9.0 to 14.1. The reach of river for which these values were computed was fairly straight and about 1,500 ft. long.

The retarding basins of the Miami Conservancy District hold water only intermittently, and then for relatively short periods. Reduction of storage capacity due to silt deposits is not a serious problem. Nevertheless, it was considered worth while to arrange for the collection of some data on silting, particularly in the two basins in which flooding is most frequent.

Silt-catching boxes of special design (Fig. 5) were installed at various elevations in the reservoirs above the Germantown and Englewood dams in 1927. These boxes are 12 in. square and 6 in. deep inside. They were securely staked to the ground at predetermined elevations. Care was taken to avoid the possibility of material being washed from the hillside into the receptacle.

Soon after the subsidence of stored water, following each major storm, measurements are made of the silt in the boxes and on the projecting bases. If the material has not dried out at the time the boxes are visited, the material is carefully removed and brought to headquarters, where it is permitted to dry before measurements of the thickness of deposit are made. The recorded data include condition of ground during storm, maximum depth of water over box, duration of overflow, depth of deposit in box and on the board. In general, there was no observable difference between the amount of deposit in the box and on the projecting board.

A number of cross-sections have been taken across the valleys near the silt boxes. At intervals of a year or more these sections are repeated and plotted to a fairly large scale, so that the quantity of silt remaining as a permanent deposit may be measured.

Records have been obtained in the Germantown basin for eleven storms since the boxes were set in 1927, and for eight storms in the Englewood basin. While sufficient data are not yet available upon which to base any definite statement as to quantity and rapidity of silting, certain trends may be noted.

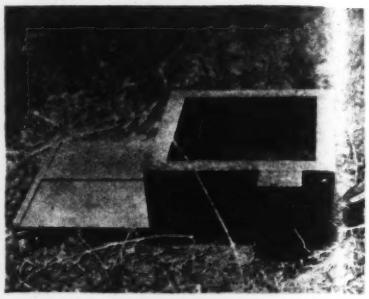


FIG. 5—SILT DEPOSIT BOX installation in flood-control reservoir. The perforated metal strip provides for draining the box after inundation. Records indicated no observable difference between silt deposit on platform and in box.

The drainage area above Germantown Dam is 270 square miles, mostly farms with the bottomlands practically all cultivated fields. The topography is rather hilly, with a relatively narrow valley. The average slope of the stream is about 8.0 ft. per mile.

A study of the records from Germantown basin indicates that the quantity of silt does not vary alone with duration of flooding but is influenced very largely by the season of the year during which the flooding occurred. Relatively heavier deposits are made during the growing season than during the winter months. This is due, no doubt, to the fact that a large part of the drainage area is under cultivation during the growing season and silt is more easily carried away during this period.

As a quantitative comparison, the record of deposit in several boxes for the storm of July 5, 1928, and for that of Feb. 26, 1929, are given: Box No. 5 was overflowed for ten hours during the July storm to a maximum depth of 6 ft., and the residual silt deposit was 1.00 in. In the February storm the same box was inundated for 70 hours to a maximum depth of 39 ft., but the deposit was only 0.75 in. Box No. 7 received 3.00 in. of deposit in twelve hours during the July flood, and but 0.94 in. in seventy hours during the February flood. From the data obtained so far, it does not appear possible to obtain a uniform rating of depth of silt deposit compared with duration of overflow, even when the seasonal influence is considered.

The silt deposit immediately upstream from Germantown Dam is considerable, as indicated by the record of a cross-section 800 ft. above the dam. The maximum depth of deposit at this section during the six years from 1927 to 1933 was about 3.0 ft. However, all of this deposit may not be permanent, as heavy summer rains that do not produce sufficient runoff to cause backwater may bring rises in the stream that will erode some of this material.

Advice for Contractors Entering Government Work

I—Compliance Not Voided by Bidding Errors

A series of articles of warning and instruction by a writer whose official work has been to interpret the intricacies of government contract policies and practices

By Howard L. Jones
Cherrydale, Va.

IN THE OLDER DAYS of normal federal public-works programs, government contractors constituted a separate species. Today most contractors that are still contracting are government contractors and probably for some time will continue such. The task of adapting themselves to environment, which contractors of the old species had accomplished by evolution, has called for revolution. This has involved fatalities that might have been avoided had the change been made with full awareness of the different conditions of government contracting.

To indicate the need of this pre-knowledge and in a measure to supply vital information, there begins in this issue a series of articles by a writer whose official work has been to learn and interpret the intricacies of government contract policies and practices. These articles have been made so brief that they may be quickly read but so concise that they require attentive reading if the full information that they furnish is to be comprehended. To contractors to whom the contracting conditions of federal public works are new we urge careful consideration of the facts that will be set forth. —EDITOR.

IT IS a provision of federal law (Sect. 3709, Revised Statutes) that "all purchases and contracts * * * shall be made by advertising a sufficient time previously for proposals respecting same." This law gives all contractors an equal right to compete for government business. The purposes of the statute were referred to in a decision of the Supreme Court, 249 U. S. 313, as follows:

"* * * the government is given the benefit of the competition of the market, and each bidder is given a chance for a bargain. It is a provision, therefore, in the interest of both the government and bidder necessarily giving rights to both and placing obligations on both."

It has been held that any advertising is sufficient that gives reasonable publicity to the needs of the government and results in obtaining the benefit of all available competition. It is usual on construction work to advertise in newspapers and trade journals and post notices in public places. In some cases notices are mailed to contractors engaged on construction work. It is essential to freely competitive bidding that as many contractors as possible be advised of the exact requirements of the government and that the lowest responsible bid be accepted.

There have been approved a group of construction contract forms among which are No. 20, "Invitation for Bids"; No. 21, "Bid Forms"; and No. 22, "Instructions to Bidders." It is the latter form to which bidders should pay particular attention. There are a number of important warnings that should be carefully heeded, the most important of which might be said to be: "Negligence on the part of the bidder in preparing the bid confers no right for the withdrawal of the bid after it has been opened." Others are that bidders must make their own estimates of the difficulties attending the execution of the proposed contract; that unless the bid is qualified by specific limitation, the government reserves the right to award all or any of the items, and that alternate bids are not considered unless called for.

The specifications

It is contemplated that there shall first be clearly disclosed, through proper plans and specifications, the actual need of the United States. Too much cannot be said of the importance of a careful consideration of the plans and specifications before preparing the bid. A failure to note some obscure detail or discrepancy between the plans and specifications may turn a profit into a loss. The standard construction contract contains this warning: "Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if mentioned in both." It has been held that under this clause a contractor is not entitled to extra payment for the installation of work shown on the drawings but not mentioned in the specifications. Where specifications are ambiguous, they may not be explained or changed verbally by a representative of the government. The written specifications should be amended and all bidders placed on a parity by re-advertising. The specifications should advise bidders of all government requirements that affect the cost of performance. Some of the standard requirements are as follows: under the President's order of March 14, 1934, all bidders must certify that they are complying and will continue to comply with each approved code of fair competition. The standard contract for public-works projects, in addition to all of the provisions of the standard construction contract, contains provisions for a 30-hour week and minimum wages. There is no authority to include in the contract any obligations affecting costs that were not fully disclosed in the specifications.

The award

It has repeatedly been held that the contract offered to the successful bidder must be the exact contract that was submitted to competition. The Attorney General in referring to the matter said:

"* * * it is well established law that a public officer given power by statute to enter into a contract on behalf of the public with the best bidder has no power to grant that bidder any term materially advantageous to him which was not announced in the advertisement for bids."

It seems settled, however, that there should be certain minimum qualifications of a bidder as a condition precedent to the letting of a contract for construction work of any considerable magnitude, but it has been held that there is no authority to require a bidder to show these qualifications prior to being permitted to submit a bid. There must be a complete showing of facts to authorize a rejection on the basis of a lack of financial standing or technical qualifications. The opinion of a government officer that the bidder might be unable to complete the work is not sufficient. The fact that a bidder is newly organized does not warrant a rejection. The standard construction contract provides that the government will make payments at the end of each calendar month equal to 90 per cent of the amount expended in carrying on the work. The work is thus largely financed by the United States.

It was held in a certain case that the requirement that the bidder must show previous construction work comparable with that bid upon was unreasonable, as such a requirement might exclude those who through exceptional ability were rising in the ranks of American industry and might favor the few who had already reached the top.

Where two projects are advertised separately and proposals are requested separately, a bidder who is high on one proposal may not have it accepted by agreeing to reduce it sufficiently to make him low bidder under both, in the event he is awarded all of the work. It has been held that information obtained through a bid received after the opening that the work could be performed at a lower price requires action to protect the interests of the United States, and the work should be re-advertised. If time of delivery is to be an element for consideration in making the award, it must be clearly stated in the request for bids.

In one case the bidder protested that the specifications were incomplete and vague. It was held that the interests of the United States as well as the bid-

ders required that no award be made under the bid received. A higher bid may not legally be accepted unless the low bid does not fully respond to the specifications, or the low bidder is conclusively shown not to be responsible.

The standard contract provisions, including those pertaining to emergency construction, will be more fully outlined in a later article.

Small Pedestrian Lift Bridge Built Mostly of Aluminum

A SMALL hand-operated single-leaf bascule of aluminum construction has been built by the Aluminum Company of America for pedestrian traffic between a loading platform and the Tube mill at the company's plant at Arnold, Pa. Aluminum members were used to reduce the dead load and to permit easier hand operation. The bridge spans a loading track alongside the building, eliminating the former practice of spotting an empty boxcar alongside a door and placing steel aprons on each side to provide a walkway between the mill and platform.

The bridge, 14 ft. long and 3½ ft. wide, is intended solely for foot traffic, and is not for loaded hand trucks, though it was designed for such a truck carrying a 500-lb. load. The trunnion and hand-operated lifting mechanism are located on the platform. When cars are to be switched on the siding, the bridge is raised and locked in a vertical position clear of the track.

A counterweight pit nearly 4 ft. square and 2 ft. 10 in. deep at the back, lined with concrete and reinforced at the top with a 5-in. steel curb angle, was cut out of the loading platform. A pillow-block bearing for the trunnion shaft is bolted to the curb angle on each side. A triangular frame of steel angles for the lifting mechanism is at the right side of the approach to the bridge. One leg is welded to the curb angle, and the other to a separate steel plate anchored in the floor slab. A steel railing is welded to the curb angle and also, on the right side, to the triangular frame. Mechanism for raising the bridge proper consists of a converted winch, operating through reduction gears to a gear sector on the trunnion shaft.

The subframe of the bridge proper consists of two longitudinal 8-in. steel channels 5 ft. long placed flange inward and welded onto the trunion shaft. The counterweight consists of two 6-in. steel billets resting between the flanges and held in place by tierods. No cross-members were needed in the subframe. The main bridge, extremely simple in design, consists of two 5-in. aluminum channels 14 ft. long, riveted back to back to the subframe channels. There are three cross-members of 5-in. aluminum channels. The cross channels are attached to the side sills by clip angles and steel rivets.

Each of the two hand railings on the lift spans consists of aluminum tubing welded into an integral frame. Welded across the lower ends of the railing uprights is a 4-in. strip which clears the deck plate by 1 in. and acts as a toe guard. The railing assembly is bolted to the deck to three-cornered sole plates welded to the upright posts.

The flooring of the lift consists of ⅜-in. aluminum treadplate extending from the free end to the pivot, at which point it is hinged to a ⅜-in. steel treadplate. The latter continues horizontally to the end of the subframe channel and then slopes downward to the surface of a loading platform. As the bridge is raised, the subframe channels at the counterweight end drop away from the steel plate, which slides back a short distance. As the bridge is lowered, the channels come up to meet and support the steel deck plate, and the free end of the bridge rests on an angle bolted to the Tube mill wall.

As a compromise between a perfectly balanced bridge and a bridge without a counterweight, the structure was overbalanced in the down direction by an amount equivalent to 57 lb. at the free end. In practice it was found necessary to add a latching arrangement at the free end to take care of the extreme case of two men stepping on the counterweight end at once. By a second latch the bridge can be fastened and locked in the open position.

FIG. 1—HAND-OPERATED BASCULE for pedestrian traffic built of aluminum to reduce dead weight and permit easy operation.

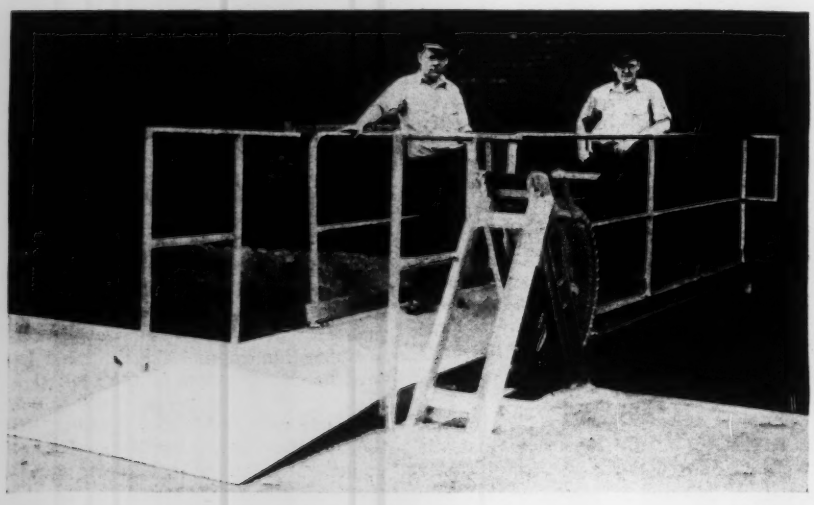
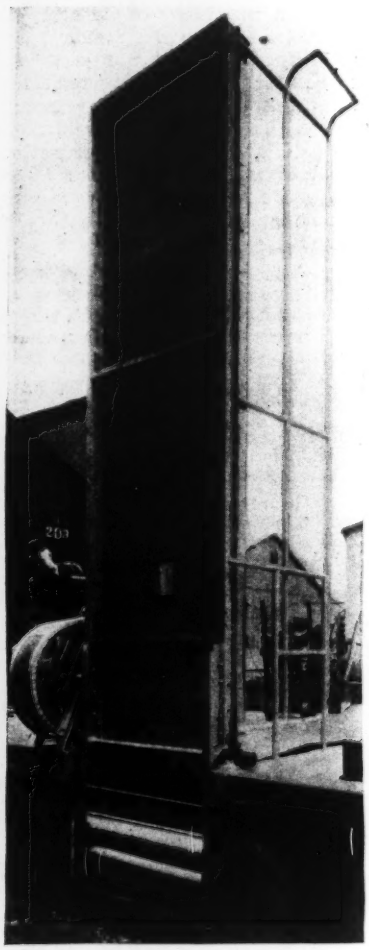


FIG. 2—THE SIMPLE DESIGN of the bascule span is evident from this view of the bridge in open position. The steel counterweights and subframe (large channels at lower end) are painted aluminum to harmonize with the rest of the structure.



The Question of Thin and Thick in Road Surfaces

Two schools of design thinking on flexible surfacing for roads are presented in the following accounts of practice in West Virginia and in Oregon

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Thin Pavements Practical on Natural Soils

By Bernard E. Gray
Chief Highway Engineer, Asphalt Institute, New York, N. Y.

OPPOSING OPINIONS on base construction for flexible pavements are presented in the two articles that follow. Inflexibility of base or foundation is accepted as fundamental in both arguments. In one the means presented for securing this property is stabilization of the natural soil of the roadbed; in the other, inflexibility is obtained by replacing the roadbed soil by an artificial foundation of material that will not change form. Choice between the two is a function of relative practicability and cost. With inflexibility obtained, the question swings to the thickness of bituminous surfacing required. In the experience of Mr. Gray this need not exceed 1 in., and in the practice of Mr. Baldock it is at least 2 in. and may be as much as 5 in. Two schools of current thinking on flexible pavement design are represented by these two articles. —EDITOR.

IN 1922 the writer was engaged in the design and construction of highways in West Virginia. On one of the projects the natural roadbed was composed of shale which, though unimproved, was usually firm except under severe moisture conditions. The design adopted called for a 5- to 8-in. stone base with a 3-in. waterbound macadam top course. Some 60 miles were completed.

The writer became interested in the possibility of reducing pavement thickness on those sections where the subgrade appeared to have unusual stability. It was decided on a test section to omit the base course entirely and to place the 3-in. macadam surface upon the natural soil. Some 3 miles were thus constructed. These have since been maintained in a manner similar to the adjoining miles, viz.: a bituminous-surface treatment every three or four years. After twelve years' service under mixed traffic (including buses and heavy trucks) this section appears equally good with all the rest, even though the initial cost was less by one-half. All of the route is in excellent condition.

Later, many miles of natural roadbeds on other routes were given bituminous treatments. An empirical formula based upon soil composition as compared to road behavior was finally worked out and thereafter employed in selecting the shales for top dressing on grading projects with a view to producing a uniform surface. It worked well.

This and other experience and observation have led the writer to believe that there is a method whereby natural soil values can be calculated and a rational design developed for any given set of conditions that will more completely utilize these values than has previously been the case.

Controlling soil moisture

Keeping in mind that every natural soil has a degree of moisture content at which it can support almost any load, it follows that the first step in design is to determine the amount of permissible variation in moisture content and how it may be most economically controlled. We know that moisture enters a soil in two ways: one from the surface by percolation under rain and snow; the other from underground water by capillary attraction. We further know that in the great majority of soils loss of stability results from too much moisture rather than too little, so that the problem in subgrade stability is to reduce the effect of surplus moisture. The practical design, then, is one that will minimize the effects of (1) surface water and (2) capillary water.

The first is relatively easy, as it is purely a matter of waterproofing—i.e., building a roof over the road surface that will prevent the entrance of water by shedding it away to the sides quickly and completely. This may be accomplished by means of relatively thin inexpensive bituminous mats and the construction of necessary ditches that really function.

There are several ways in which capillary water may be either eliminated or reduced in the road surface: one by designing the road grade at an elevation above the groundwater level that will be beyond the range of capillary pull, and the other a modification of the soil itself by admixture with other soils or by the introduction of layers of material that will break the capillary rise. The so-called high-line grade of Minnesota is an intelligent example of the first method and is applicable to any flat or

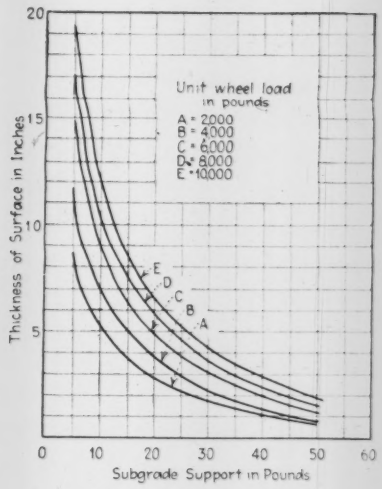

CHART showing variation in required surface thickness according to subgrade support and unit wheel load.

THICKNESSES OF PAVEMENT REQUIRED FOR DIFFERENT DEGREES OF SUBGRADE SUPPORT UNDER VARIABLE WHEEL LOADS

S Subgrade Support, Lb.	W Unit Wheel Load, Lb.	Thickness of Pavement In. (t+e)	t	S Subgrade Support, Lb.	W Unit Wheel Load, Lb.	Thickness of Pavement In. (t+e)	t
5	2,000	11.3	8.5	30	2,000	4.6	1.8
	4,000	15.8	11.6		4,000	6.8	2.4
	6,000	19.5	14.6		6,000	8.1	3.2
	8,000	22.6	17.1		8,000	9.2	3.7
	10,000	25.2	19.2		10,000	10.3	4.3
10	2,000	8.1	5.3	35	2,000	4.3	1.5
	4,000	11.3	3.1		4,000	6.0	1.8
	6,000	13.7	8.8		6,000	7.4	2.5
	8,000	15.8	10.3		8,000	8.5	3.0
	10,000	17.8	11.8		10,000	9.6	3.6
15	2,000	6.6	3.8	40	2,000	4.0	1.2
	4,000	9.1	4.9		4,000	5.6	1.4
	6,000	11.3	6.4		6,000	6.9	2.0
	8,000	13.0	7.5		8,000	8.1	2.6
	10,000	14.5	8.5		10,000	8.9	2.9
20	2,000	5.6	2.8	45	2,000	3.8	1.0
	4,000	8.1	3.9		4,000	5.3	1.1
	6,000	9.8	4.9		6,000	6.5	1.6
	8,000	11.3	5.8		8,000	7.5	2.0
	10,000	12.6	6.6		10,000	8.4	2.4
25	2,000	5.1	2.3	50	2,000	3.5	0.7
	4,000	7.1	2.9		4,000	5.0	0.8
	6,000	8.7	3.8		6,000	6.2	1.3
	8,000	10.1	4.6		8,000	7.1	1.6
	10,000	11.3	5.3		10,000	8.0	2.0

gently rolling country, as a means of maintaining a stable subgrade condition. It may mean 10,000 to 20,000 cu.yd. of excavation and may cost as much as $6,000 a mile, but it makes possible a more than compensating reduction in pavement costs, to say nothing of expediting snow removal. Furthermore, it is a more permanent improvement than any pavement can possibly be and, therefore, may be financed over a longer period of time. The second method may consist of placing either a layer of sand, gravel, cinders or other material of low capillarity, or thin mats of bituminous material separated by soil layers to serve as cut-off barriers. Then there are also combinations of both drainage and soil treatments.

In rolling or mountainous country, raising the roadbed on a fill section is not always practicable. Proper underdrainage with perforated iron pipe or strong tile properly backfilled will work wonders with many situations formerly thought of as requiring massive foundations. The use of bituminous mixtures in backfilling underground drainage lines, to prevent silting, is a recent development in this field. Then there are methods of impregnating soils with bituminous materials or mineral salts that raise the bearing values, all of which are but a few examples of what may be done with the natural soils to increase very greatly their utility as foundations. Recent studies in this regard by the Dow Chemical Co. and the American Bitumuls Co. are of much value in pointing these possibilities.

There has been some peculiar quirk in the minds of many engineers whereby they were satisfied to buy large quantities of material brought from a distance to build a pavement and yet will not be convinced that equal strength may be had with the natural local soils. It is certainly better engineering to utilize fully inherent subgrade values, through careful study of their characteristics, than to ignore them and pay needlessly for artificial surfaces.

In order to transmit the load to the subgrade, the pavement only need be sufficiently strong to resist internal displacement, and accordingly the important laboratory test is one to determine stability under various loads. In addition to having sufficient stability to resist shear and crushing, the bituminous pavement must be so dense as to be waterproof and durable. Both of these qualities are susceptible of accurate laboratory measurement, and from these data the specifications controlling construction practice are developed.

The accompanying table shows the thickness of flexible surfacing required for five different wheel loadings on subgrades ranging from 5 to 50 lb. support value per square inch. Under (t + e) is shown thickness of surface without regard to area of tire contact, while under t is found the minimum thickness taking this factor into consideration. Fig. 1 shows the latter information in the form of curves. One striking feature apparent from these curves is the great economy resulting from improving low support soils.

Impact load negligible

Some question also has been raised as to the unit wheel load to be used for any particular size of motor vehicle, particularly the values to be allowed for impact. While many studies have been made in this regard, the results are certainly open to considerable doubt, and the probabilities are that it was the impact on the vehicle rather than on the road that was measured. From experience and long observation of pavement behavior, there is most reason to agree with Clifford Older on the subject, in that where a road surface can be constructed and maintained in a reasonably smooth condition there is no necessity to make any allowance for impact in the design of a pavement. The reason is simple—where there is no surface unevenness there can be no impact. With the very smooth surfaces being built today, the improved motor vehicle and the pneumatic tire in general u[illegible] would appear ill-advised to pay [much] attention to ten-year-old test r[esu]lts, especially when they impose a t[otally] unnecessary additional road cost. The unit wheel load therefore is that part of the total weight of the loaded v[ehicle] actually borne thereon. Naturally the rear wheel load is taken for design purposes, being the largest concentration.

Conclusions

It may be that such assumptions will result in a few isolated failures where subgrade stabilization is not complete, but the experience gained in caring for large mileages of low-cost roads has proved definitely that, for the lowest total cost of construction and maintenance, it is sounder economy to repair such small areas than to build all the surface unnecessarily thick to provide for a few contingencies. The bituminous surfaces lend themselves particularly well to such procedure, because the repairs may be made immediately as required, and often the broken surface itself may be salvaged and replaced, especially in the low-cost types.

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Thick Road Bases Held Essential in Oregon

ORIGINATED to prevent frost damage, a policy of placing on the subgrade very thick bases of gravel or crushed rock has been adopted for practically all roads built on the Oregon state highway system, according to R. H. Baldock, chief engineer, Oregon state highway commission. Bank-run gravel or talus material is used for bases under about 75 per cent of the road mileage, and on the remaining 25 per cent (including all bituminous surfacing) crushed rock (usually basalt) is used. Gravel or crushed-rock bases are used under concrete pavement as well as under bituminous surfaces.

Capillary attraction and the pumping action caused by traffic over hard pavement, Oregon experience has shown, tend to draw water up through the subgrade to the under side of the pavement unless a thick porous base intervenes. Hence the total thickness of road structure is varied in proportion to moisture content and to the frost danger in the particular locality where the road is built. For the extensive road network of the Willamette Valley, where the frost depth rarely exceeds 6 in., a 9-in. to 12-in. base thickness is standard. Oregon highways also traverse regions where temperatures well below zero are not uncommon; in these localities, where moisture has access to the subgrade, thicknesses of gravel base up to 24 in. have been used. Thicknesses of 12 to 20 in. are used extensively in certain regions and for certain extreme cases the advisability of using an even greater thickness of gravel base has been considered.

In special cases where the drainage is poor and the soil is subject to frost action, the practice has been to trench the sub-grade along the center line and to lay agricultural tile or concrete pipe with perforations. The trenches are filled with the same kind of material that is used in the overlying road base.

After the subgrade has been prepared, the gravel is dumped from motor trucks, spread with a bulldozer and finally smoothed with a grader. This is topped off with a final smoothing course of about 2 in. of crushed rock or gravel. Where crushed rock is used, an approximation of waterbound macadam, built by machine, is placed with the aid of very little water, using in the first course rock that ranges from 4½ to 2½ in. in diameter. This is keyed with a layer of finer rock, usually 1¼- to 1¾-in. size, finished off with screenings of less than ¾-in. size. A crushed-rock base of this sort costs about $1.50 per cubic yard, in place.

Gravels suitable for road bases are found so extensively in Oregon that ordinarily the haul to the job is not more than 1 mile, and very rarely exceeds 3 miles. Under these conditions the cost of gravel spread in place on the subgrade ranges from 30c. to $1 per cubic yard and probably averages about 50c. per yard. Bituminous surfacing ordinarily has a maximum thickness of 3 in., although a small amount has been laid with a thickness of 5 in. The total cost of oiled or bituminous roads built as described varies from $7,500 to $15,000 per mile for base thicknesses ranging up to 18 in.

Construction Starts Soon on Muskingum Flood-Control Dams

Bids to be opened Nov. 13-17 for three of fifteen dams in Muskingum Valley project in Ohio—Total cost estimated at $35,290,000

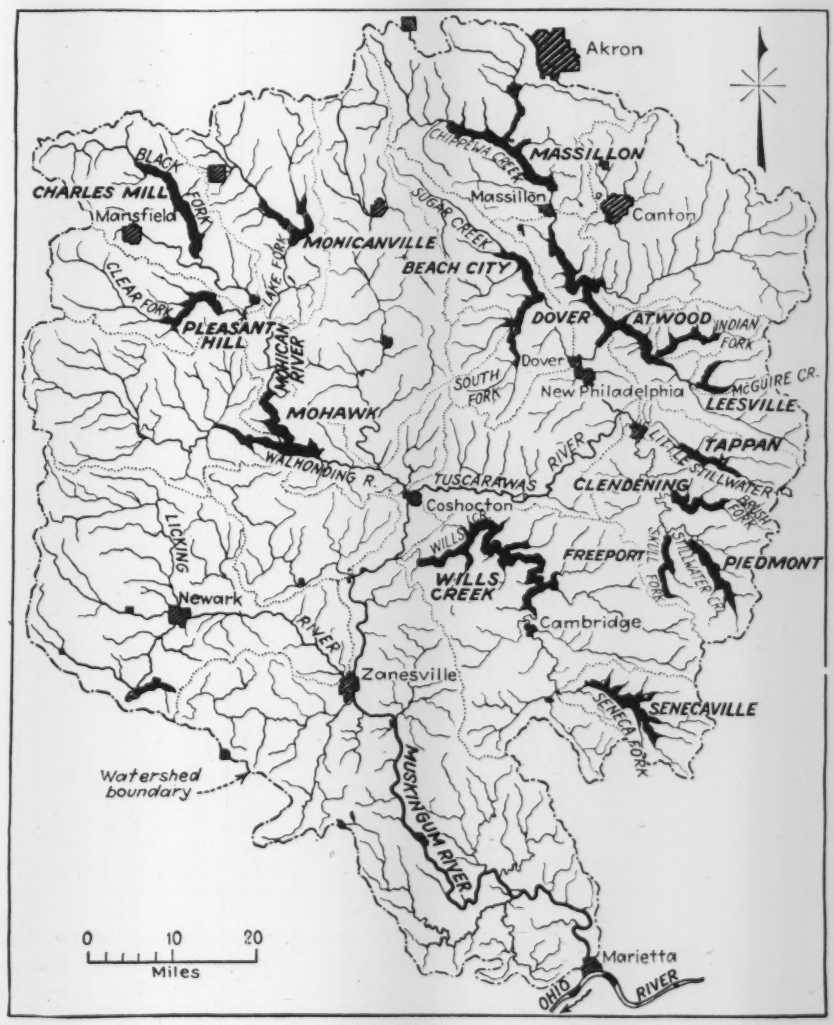
By Theodore T. Knappen
Chief, Engineering Division, Zanesville Engineer District, U. S. Engineer Dept., Zanesville, Ohio

THE CALL FOR BIDS to be opened this month for the building of the Wills Creek, Tappan and Charles Mill dams marks the start of construction operations on the Muskingum Valley water-conservation and flood-control project in southeastern Ohio. General features of the preliminary plan of the Muskingum Watershed Conservancy District and its contract with PWA for the development and construction of a system of flood-control and water-conservation reservoirs were reported by C. C. Chambers, chief engineer of the Conservancy District in *ENR*, June 31, 1934, p. 799. Funds under this contract were released May 1, 1934, to the Corps of Engineers in the amount of $22,090,000 for the development of a plan and the construction of the dams and railroad and public utility relocations. Under the contract, the local interests—that is, the conservancy district and the state of Ohio—are to furnish the rights-of-way and the flowage easements, and will relocate the highways.

For some time prior to the release of funds a small organization had been making control surveys and laying plans for comprehensive investigations and surveys for the project. These preliminary plans called for some 25 large survey parties on reservoir, railroad, public utility and hydrographic surveys of possible reservoir locations. In connection with these surveys and as a basis for mapping the proposed reservoir areas, the flying and photographing of an area of 300 square miles was undertaken. For the investigation of foundation conditions at the important dam sites under consideration, 45 diamond-drill core-boring outfits were employed for a period of more than two months. Extensive test-pit and auger-boring work was also carried out. A soil-testing laboratory was set up, equipped to make grain-size analyses, water-content determinations, and permeability, consolidation and shearing tests. Much of the equipment was developed specifically for the purpose. To supplement further the foundation investigations, the Bureau of Mines was called upon to carry on geophysical investigations by the electrical resistivity methods at proposed dam sites. A large force of engineers and geologists was built up as rapidly as qualified men could be obtained to carry on the hydrological and flood studies, study reservoirs and reservoir combination, and determine their effect on past and predicted floods, and to design and estimate the cost of dams, railroad and public utility relocations. As a result of this coordinated and comprehensive study, a Plan of Flood Control and Water Conservation Reservoirs for the Muskingum Watershed Conservancy District was submitted to the Chief of Engineers, United States Army, on Aug. 1 for approval, and with his approval was presented to the Conservancy District on Aug. 8.

The plan prepared is illustrated in the accompanying map, and the data on the fifteen reservoirs are presented in Table II, both from this report. This was selected as the best plan, after investigating numerous combinations of the 151 reservoir sites studied, and differs somewhat from the preliminary plan previously published. As in the case of the Miami Conservancy District, one of the hardest beliefs to overcome was the small reservoir idea. To set this matter definitely at rest, a plan for the construction of the best 50 small reservoirs in the watershed was set up. This plan costs the same as the adopted plan. It provided 762,700 acre-ft. for the flood control and 333,400 acre-ft. for water conservation. It provided control over less than half the area controlled by the

FINAL PLAN of flood control and water conservation in Muskingum Valley calls for fifteen dams and reservoirs. The Charles Mill, Wills Creek and Tappan dams are scheduled for early construction.



adopted plan, and was only about one-third as effective. By this it is not meant to depreciate the value of some small reservoirs; in fact the best of the small reservoirs studied were included in the adopted plan. These, of course, were located favorably and provided flood control and water-conservation storage in their areas at a lower cost than did the comparable large reservoirs.

The studies leading to the adoption of the plan brought out the importance of having at least two-thirds of the area under reservoir control, and of having the reservoirs evenly distributed over the area. The watershed map discloses that the Muskingum River is formed by the junction of the Tuscarawas and Walhonding Rivers at Coshocton, each draining about the same area. Table I shows the even distribution of control between these rivers and the area between Coshocton and Zanesville.

A careful study of the flood-control characteristics of this basin developed the fact for this watershed that most efficient control could be developed by gate-controlled reservoirs rather than the uncontrolled type used in the Miami Conservancy District. The dams will generally be of rolled-earth construction, with outlet conduits in rock tunnel or benched in rock at one abutment.

TABLE I—DISTRIBUTION OF FLOOD CONTROL ON VARIOUS RIVERS IN MUSKINGUM VALLEY

Watershed	Total Area, Sq. Mi.	Areas Controlled by Reservoirs, Sq. Mi.	Per Cent
Walhonding River	2,252	1,501	66.6
Tuscarawas River	2,590	1,968	76.0
Muskingum River between Coshocton and Zanesville	1,217	844	68.8
Muskingum at Zanesville above the Licking	6,059	4,313	71.2

Where possible, saddle spillways have been utilized; in other cases, side spillways, combined spillway and outlet structures, and morning-glory-type structures were adopted. One large concrete gravity dam is contemplated in the gorge of the Tuscarawas River above Dover and 125 miles of railroad trackage will be raised or relocated under the project.

The mechanics of the Ohio Conservancy law are such that approval of the plan by the Conservancy Court cannot be expected before the middle of November. However, to expedite construction work when this approval is forthcoming, immediately on the submission of the plan work on the detailed preparation of plans was initiated. More complete foundation and borrowpit investigations were undertaken, and intensive laboratory study was made of materials. Experiments were started also at the Case School of Applied Science's hydraulic laboratory, to design the outlets and stilling structures for the proposed dams.

The plans are now ready on three of the fifteen proposed dams, bids for which will be opened Nov. 13, 15 and 17. These are Wills Creek Dam on Wills Creek, 7 miles south of Coshocton, Tappan Dam on Little Stillwater Creek, 9 miles southeast of Dennison, and Charles Mill Dam, 8 miles east of Mansfield.

The Wills Creek Dam, 2,000 ft. long, 85 ft. high, of the rolled-fill type with loose dumped rock shells, involves 500,000 cu.yd. of embankment, 400,000 cu.yd. of excavation and 30,000 cu.yd. of concrete. The Tappan Dam is 1,400 ft. long, 55 ft. high, of the rolled-fill type. Principal quantities are 370,000 cu.yd. of embankment, 170,000 cu.yd. of excavation, 4,500 cu.yd. of concrete and 500 ft. of tunnel. The Charles Mill Dam consists of a main embankment, 53 ft. high and 1,350 ft. long, and two dikes. The principal quantities are 380,000 cu.yd. of embankment, 65,000 cu.yd. of excavation and 10,000 cu.yd. of concrete.

The work will be carried out by the Corps of Engineers under the general supervision of the Chief of Engineers and Lieut.-Col. R. G. Powell, division engineer, Ohio River Divison. Major J. D. Arthur, Jr., district engineer of the newly created Zanesville Engineer District, is in direct charge. Consultants include Joel D. Justin, Wm. Gerig, Chas. Taylor, W. H. McAlpine and Professors Glennon Gilboy, G. E. Barnes and Chas. Allen. A force of 200 engineers and draftsmen is engaged on the design work. The Conservancy District has cooperated in the preparation of plans through C. C. Chambers, chief engineer, and A. R. Pauls, Charles H. Paul and Prof. Sherman Woodward, consultants.

TABLE II—CHARACTERISTICS OF OFFICIAL PLAN OF RESERVOIRS, MUSKINGUM WATERSHED

Reservoir	Stream	Drainage Area		Elevations		Capacity			
		Total at Site	Net*	Max. Flood El Line	Water Conserv. Pool	Total	Flood Control	Water Conserv.	Flood Capacity
		Sq. Mi	Sq. Mi.	Ft.	Ft.	Acre-Ft.	Acre-Ft.	Acre-Ft.	In.
Charles Mill	Black Fork	216	216	1,020	997	88,000	80,600	7 400	7.0
Wills Creek	Wills Creek	844	723	779	742	188,000	184,000	4,000	4.8
Tappan	Lt. Stillwater Cr.	71	71	909	898.5	54,900	26,400	28,500	7.0
Mohicanville	Lake Fork	269	269	963	943	106,000	100,000	6,000	7.0
Beach City	Sugar Creek	300	300	976.5	945	71,700	71,000	700	4.4
Pleasant Hill	Clear Fork	199	199	1,065	1,020	87,700	74,200	13,500	7.0
Mohawk	Walhonding River	1,501	818	890	805	288,000	287,500	500	6.6
Dover	Tuscarawas River	1,397	847	920	874	270,700	269,700	1,000	6.1
Massillon	Tuscarawas River	432	432	959	935	104,000	102,900	1,100	4.5
Clendening	Brushy Fork	70	70	912	900	54,100	26,100	28,000	7.0
Senecaville	Seneca Fork	121	121	842.5	832	94,000	45,000	49,00	7.0
Piedmont	Stillwater Creek	84	84	926	915	65,000	31,400	33,600	7.0
Leesville	McGuire Creek	48	48	974	961.5	37,100	17,900	19,200	7.0
Freeport	Skull Fork	46	46	910	901	35,600	17,200	18,400	7.0
Atwood	Indian Fork	70	70	941	929.5	54,100	26,100	28,000	7.0
	Total		4,314			1,598,900	1,360,000	238,900	5.9

Reservoir	Stream	Area		Estimated Cost			
		Max. Flood El Line	Water Conserv. Pool	U. S. Note (A)	Conserv. Dist. Note (B)	State of Ohio Note (C)	Total
		Acres	Acres				
Charles Mill	Black Fork	6,050	1,350	$734,000	$465,000	$309,600	$1,508,600
Wills Creek	Wills Creek	10,800	600	2,141,000	890,000	750,800	3,781,800
Tappan	Lt. Stillwater Cr.	2,700	2,000	747,000	310,000	525,400	1,582,400
Mohicanville	Lake Fork	9,300	500	598,000	648,000	87,700	1,333,700
Beach City	Sugar Creek	6,150	220	2,196,000	670,000	180,000	3,046,000
Pleasant Hill	Clear Fork	2,600	850	1,484,000	400,000	70,100	1,954,100
Mohawk	Walhonding River	7,750	150	3,444,000	1,045,000	571,400	5,060,400
Dover	Tuscarawas River	13,870	350	3,845,000	1,680,000	433,700	5,958,700
Massillon	Tuscarawas River	11,500	300	3,358,000	1,640,000	523,400	5,521,400
Clendening	Brushy Fork	2,725	1,925	579,000	120,000	41,600	740,600
Senecaville	Seneca Fork	5,200	3,500	607,000	332,000	98,800	1,037,800
Piedmont	Stillwater Creek	3,340	2,400	1,028,000	168,000	38,300	1,234,300
Leesville	McGuire Creek	1,640	1,200	540,000	80,000	28,300	648,300
Freeport	Skull Fork	2,260	1,475	565,000	92,000	180,800	837,800
Atwood	Indian Fork	2,600	1,775	724,000	190,000	130,100	1,044,100
	Total	88,485	18,595	$22,590,000	$8,730,000(D)	$3,970,000	$35,290,000

(A) Includes dams, spillways and outlet structures; and relocations and/or changes to railroads and public utilities, and the cost of preparation of the official plan.
(B) Includes titles to all necessary lands and easements; and appraisal, administrative, legal and other expenses incident thereto.
(C) Includes the expense (including construction costs) of all necessary relocations and vacations of public highways.
(D) Increased from original amount in contract between the United States and the Conservancy District on account of increased benefits from the project and official plan over the preliminary plan of reservoirs.
(*) Less area reservoired above.

Development of official plan

A letter from C. C. Chambers, chief engineer, Muskingum Watershed Conservancy District, contains additional information and comments about the development of the official plan, as follows:

Pursuant to the contract between PWA and the Muskingum Watershed Conservancy District, a plan of flood control and water-conservation reservoirs has been prepared for the district by the U. S. Engineers in cooperation with the Conservancy District. This plan includes fifteen reservoirs. The plan is based upon detailed engineering studies, surveys, foundation explorations and estimates made by the U. S. Engineers. These studies included investigation of over 150 possible sites for reservoirs. Preliminary surveys, foundation borings and estimates were made at all of the more favorable sites. Surveys, foundation explorations and estimates have been made in more detail at the sites finally adopted.

The principal changes in the locations of the reservoirs in this plan from the tentative locations named in the article of June 21 were the addition of two reservoirs on tributary streams of Stillwater Creek; the substitution of a reservoir on the Tuscarawas River above Dover for the reservoirs tentatively located on Killbuck Creek and Wakatomika Creek; a site for a reservoir on Sugar Creek instead of its tributary stream, Walnut Creek; and the substitution of a reservoir on the Tuscarawas River above Massillon for the reservoir tentatively located on Sandy Creek.

Since this project is being worked out under the conservancy act of Ohio, it is necessary that the plan be made the official plan of the district, in accordance with the requirements of that law, before construction work can begin. The law provides that after statutory notification the board of directors will hear all written objections to the proposed plan that are filed before a specified date. After these hearings the board adopts a plan as the official plan of the district. Persons objecting to the official plan so adopted may file their objections within ten days after the adoption, which objections are heard by the conservancy court not less than twenty nor more than thirty days after the time fixed for filing objections. This entire procedure requires at least 2½ months.

The hearings before the board of directors have been completed, and the board has adopted an official plan for the district, which plan provides for the construction of fourteen reservoirs and includes all of the reservoirs in the plan proposed by the U. S. Engineers, except the reservoir on the Tuscarawas River above Massillon. Engineering studies, based upon more detailed data, made subsequent to the time of filing the plan with the Board of Directors, showed that the Massillon reservoir would give only partial flood protection to the city of Massillon, and that the reservoir tentatively proposed for Sandy Creek would afford greater flood-control benefits to the rest of the district than the Massillon reservoir. These studies also showed that much better flood protection can be provided for Massillon by channel improvement at a cost less than the increased cost of the Massillon reservoir over the Sandy Creek reservoir.

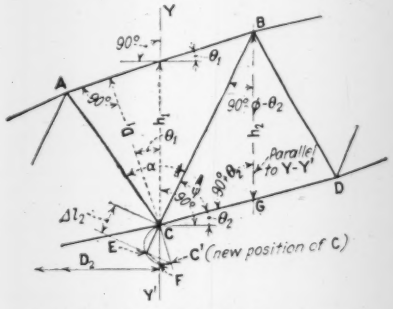
In order to avoid any undue delay in getting construction work started on the project, the board of directors included only the fourteen reservoirs in the official plan. The conservancy act provides the method whereby this plan can be amended and the proposed reservoir on Sandy Creek added to the plan later.

The Conservancy Court will begin hearings on objections to the official plan about Nov. 9. If the plan is approved by the court, work can then start on the construction of the dams. In anticipation of that approval, the U. S. Engineers are now advertising three of the dams.

Letters to the Editor

Truss Deflections

Sir—In your issue of June 7, 1934, there appears a letter from D. B. Hall which introduces a purely geometric solution for truss deflections. He presents it as a convenient method for the special case of parallel chords. It is equally convenient for use with trusses of irregular shape, as shown in the accompanying illustration. Deflections are to be measured in the direction of Y-Y′.



GEOMETRIC SOLUTION of deflections for a truss with non-parallel chords.

Deflections caused by change of length Δl_1 of any chord member, AB:

With BC fixed in position, the structure to the left rotates about C, the center of moments for AB. Then,

$$\Delta\alpha = \frac{\Delta l_1}{D_1} = \frac{\Delta l_1 \sec.\ \theta_1}{h_1}$$

Deflections caused by change of length Δl_2 of any web member, CB, of length l_2:

FC' is drawn perpendicular to Y-Y'. Then E and F lie on a circle drawn on CC' as a diameter. From the geometry of the figure,

$$CF = \Delta l_2 \csc\ \phi \cos.\ \theta_2 = \Delta l_2 \frac{CB}{BG} = \Delta l_2 \left(\frac{l_2}{h_2}\right)$$

With BD fixed in position, the structure to the left rotates about the center of moments for CB, the intersection of AB and CD. The angle of rotation for change of length Δl_2 in CB is

$$\Delta l_2 \left(\frac{l_2}{h_2 D_2}\right) = \Delta l_2 \left(\frac{l_2}{h_2}\right)\left(\frac{\tan\theta_1 - \tan\theta_2}{h_1}\right)$$

Assuming any member to stand fast, the deflections may be computed and these results corrected to the known condition of zero deflection of supports.

WILLIAM BERTWELL.

Helena, Mont.,
Sept. 5, 1934.

For Modernizing Wind Design

Sir—The articles on aerodynamics by W. Watters Pagon that appeared in your issues of March 15, July 12 and Oct. 11 are so much above the average that I feel the urge to compliment both the author and publisher for their appearance. Structural engineers and authors of textbooks are in general so far behind the times on the subject of wind pressure that articles such as those by Mr. Pagon are unusually significant and long overdue.

The Smeaton-Rouse formula that $P = V^2/200$ appeared in 1759. This was in general use until about 1900 when the Marvin formula, $P = 0.004\ V^2$, was quite the accepted one. The careful experiments of Langley, Stanton, Eiffel and others developed the formula $P = 0.0033\ V^2$, which was the one quoted in the A.S.C.E. subcommittee report of March, 1931. All of these formulas are for the total pressures in lb. per sq.ft. as observed experimentally on thin flat plates or pressure boards.

For 175 years the idea has prevailed that the wind pressure on the vertical side of a building is the same as that on a thin flat square board placed normal to the wind. Mr. Pagon's article of March 15 shows that more thorough experiments prove that this total pressure on flat plates is the combined effect of a pressure against the plate on the windward face and a suction or negative pressure on the leeward face. What becomes of the negative pressure when the flat plate is assumed to be a part of the side of a building? Moreover, the side of a building is usually rectangular, not square, and the flow of air is about the upper side and the two ends instead of about all four edges. It would seem that the article ought to settle once and for all that the pressure on buildings and flat plates is entirely dissimilar and that the formulas now in use are based on wrong assumptions. So far as practice goes, the structural engineer has no formula or means at hand for correctly converting wind velocity to wind pressure. Is it not about time that structural engineers begin to make use of data now available that is based on experiments with much improved apparatus and on similar, not dissimilar, objects?

Of particular importance is the evidence that the practice of using the Duchemin or Hutton formulas for roofs is greatly in error, especially for flat slopes.

I hope that the subject will be further developed by future articles, leading to practical application to building design of the principles already set forth by Mr. Pagon.

GEO. E. HOWE,
Assistant Engineer,
American Bridge Co.

New York, N. Y.,
Oct. 2, 1934.

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November 1, 1934

A Constructive Decision

SHALL the federal government go into the manufacturing business? One answer to this highly disturbing question was given a few days ago, when the Tennessee Valley Authority awarded contracts for more than a million barrels of cement and simultaneously announced that it had abandoned a long-discussed plan to build a cement plant of its own. The plan was early challenged by the industry as unnecessary and unsound, and thereupon the two parties entered into an exhaustive study of the questions involved—as remarkable and gratifying a piece of cooperation between industry and governmental agencies as we can call to mind. There was give and take on both sides before a decision was reached, and rumor has it that the final contract prices are far from remunerative to the manufacturers. But regardless of detail the decision against government manufacturing is emphatically constructive. It helps to remove one of the fears that for months has frozen business and industrial initiative, the fear that the private enterprise on which our whole history is built will be destroyed by the government's entry into the manufacturing field. What would be yet more constructive would be a clear declaration by the Administration that it intends to adhere consistently and in all departments to the policy represented by the TVA decision, and to keep out of government manufacture in any form.

A Question of Fact

IT IS REGRETTABLE that the American Society of Civil Engineers should find reason for considering the addition of a new rule to its code of ethics, which would outlaw the use of "the advantages of a salaried position to compete unfairly with other engineers." The intent as well as the phrasing of the proposed rule merits approval, but unless the need for it can be demonstrated convincingly its adoption would be nothing more than an unfortunate reflection upon high-principled members of the profession. We believe that the cases to which the proposed rule is meant to apply are negligibly few in number. Moreover, the professors and testing-laboratory men in the colleges and the engineers employed in public or corporate positions against whom the new rule is directed are in the large majority men of sensitive ethical perception, and it is only to such men that a code of ethics makes appeal; these do not need the rule, however, and others will ignore the rule. It should also be remembered that unfair competition is already outlawed by the whole spirit of the existing code, and therefore the new rule adds nothing beyond an implied obligation to observe the customary scale of charges. Since no such scale is recognized, the effect of the rule is questionable in this regard also. In short, the rule will hardly be effective in reaching the willful violator, and it can be used for harassing the well-meaning engineer. In spite of all these objections, if the case for the new rule is pressing enough, it should be adopted, but not otherwise. The issue thus is plainly a question of fact. Before members vote, the supporters of the rule should demonstrate convincingly that there is adequate reason for its passage, and each member would do well to test the question by his own experience before undertaking to vote.

Water Starts to Flow

LAST SUNDAY San Francisco experienced its long-awaited thrill in the ceremony that started mountain water flowing into local reservoirs. Completion of the Hetch Hetchy project, which was saddened by the death of M. M. O'Shaughnessy two weeks ago, signalizes the accomplishment of a monumental water-supply achievement, boldly conceived and vigorously carried out. The event will probably go down in San Francisco history as a well-recognized civic milestone and take its place with "the fire" and "the exposition." Well-deserved praise has been won by the engineers and construction forces for the long, hard construction battle.

In a Lifetime

SELDOM IF EVER has a man had the opportunity of seeing the birth of a great industry to which he has made a notable technological contribution, its rise to greatness and its partial decline due to other technological developments, as was the case with Frank J. Sprague, who died last week. A pioneer in the application of electric motors to industry, Mr. Sprague designed and built at Richmond, Va., the first street-railway system wherein the cars are operated by motors fed from a trolley system. The success of that system, built in 1887, resulted in its widespread adoption both in this country and abroad and in rapid expansion of the electric railway industry, until at the time of the commercial introduction of the internal-combustion engine it had become one of the country's foremost industries. Mr. Sprague was a rare example of inventive genius backed by a sense of the practical requirements of the task to which his energies were directed.

Vague Relationship

VAGARIES of hydrological data and the resulting uncertainties in their application are widely accepted, but occasional release of additional corroborating information warrants a repeated word of caution. The familiar term "rainfall-runoff ratio," used by hydraulic engineers in expressing the relation between the precipitation on one catchment area and the resulting flow in the stream system is admittedly a figure that is not applicable to extrapolation to cover wider areas. However, it is equally important to recognize that even on the same stream the factor is erratic almost to the point of uselessness, as indicated by widely divergent results reported in this issue from the Miami Conservancy District. Characteristics of the storm, condition of the watershed, seasonal plant growth and many other factors may result in streamflow which apparently renders impracticable any relationship between rain and streamflow. Precipitation and runoff are both definite, measurable quantities, but the establishment of any usable relationship between them should be approached with extreme caution.

A Steady Course

WHEN the President addressed the bankers last week he was in fact speaking to the people of the whole nation. He dealt with the vital need for confidence, and there is no more serious matter before the country just now than confidence. The individual initiative that springs from confidence remains our most critical need.

We have long been in the habit of accusing the bankers, and sometime with evident justice, of being the source of many of our troubles. But to charge bankers with being the source of confidence or the opposite, of having the power to start or check business initiative, is not quite in accord with the truth. For, after all, the banker is a machine for averaging the financial sentiment of his depositors and clients; he reflects the hopes, the fears and doubts of the group which he represents. And if he tempers the result with a small dose of conservatism, that is natural and salutary. The banker ought to be prudent.

So, to charge bankers with holding back the country by their over-conservatism, their unwillingness to lend, their lack of initiative and enterprise, is not to state the situation rightly. The one who lacks initiative and enterprise is the individual citizen himself. A keen student of psychology, the President no doubt has realized this clearly. In bespeaking confidence on the part of bankers, he beckoned over their shoulders to the citizen at large, and asked him to let his confidence and initiative become freely active.

In turn, it was to the people at large, that the President offered assurance of steady and stable management of national affairs. Events must have made him thoroughly aware of the need for such assurance.

The country has in recent months come to look intently toward Washington to read the signs before venturing anything. It has seen recovery campaigns start and stop, policies change disconcertingly and suddenly. It has learned to realize that it cannot safely make a commitment for next month because the underlying policies might undergo radical change tomorrow. And therefore it has found it prudent not to venture.

It has heard many forecasts of industrial harmony through improvement in the condition of labor and the establishment of fair means of adjustment of labor disputes, and yet it has lately been forced to witness riotous strikes. It has had promises of industrial self-government, and encountered arbitrary dictatorship instead. It has been invited and urged to plan works projects for re-employing the idle under a liberal Congressional mandate, only to find that these projects had to run the gauntlet of a scrutiny more rigid than that of banking procedure. It has been told that revival of industry was the government's great objective, later to see industry disheartened by governmental flouting of codes, entry into manufacture and demand for preferential prices.

In the face of such experiences, no citizen, no industry, could chart its course ahead. It could not put initiative and new enterprise into its operations. It could not venture new investments. It could merely wait.

While thus waiting, the country has seen all the major engines of recovery brought into action, to produce only a moderate result. It has seen prices and business activity rise hopefully and slack off again. It has seen involuntary unemployment maintain its full volume and even increase, with frequent forecasts that it will rise to unprecedented heights this winter. Thus the recovery of economic life that was looked for did not come into being—because individual confidence and initiative did not remain virile.

Does last week's talk between the President and the people mean that all this is changed? Will the reasons that kept individual confidence from awaking no longer exist, and are disorganizing changes of policy and plan to give way to a steady course? If so, there could be no better basis for confidence and a recovery campaign in which everyone would do his part.

Higher Railroad Speeds

LAST WEEK'S spectacular run of the Union Pacific's new light-weight streamlined train from Los Angeles to New York in 56 hours and 55 minutes serves to draw attention not only to the possibilities of trains of that general type for improving railway passenger service but also to questions of operating costs and to the track-structure problems that the introduction of higher speeds must bring. Because the track problems are of immediate interest to the civil engineer they are discussed here, leaving the other questions for subsequent discussion.

Railway maintenance-of-way engineers have long known that track that is safe and rides comfortably at a speed of 40 m.p.h. is often unpleasant riding and may be unsafe at 60 m.p.h. The latter is especially true where curves are frequent and sharp. This condition had an important bearing upon the speed of steam trains in the past, for, while it was found that steam locomotives could attain speeds comparable with those of the oil-electric locomotives of today, the railroad operators also found that practicable speeds were far below potential speeds. Track conditions, not locomotive capacities, limit speeds. If higher speeds are in order, track must be made more stable and surfaced with greater care.

A wide range of speed between the fastest and slowest train on curved track always introduces a serious problem of rail maintenance. Curves that are superelevated to meet the theoretical requirements of the highest-speed train are much too high for slow trains, and the inner rail then is subjected to heavy pounding by freight trains. Consequently most superelevation is a compromise between the requirements of fast passenger and slow freight, the fast passenger trains being required to reduce speed on sharp curves. With the new high-speed trains, experience soon will show whether their low center of gravity will require less superelevation of the outer rail for a given speed than is now desirable.

It is apparent from the foregoing that the advent of higher speeds in passenger service is going to call for new refinements in track structure. Until the cost of these changes is known and until more is known as to actual operating economies, little can be said as to the total savings obtainable through operation of light-weight high-speed trains. Hence it will be difficult to determine how rapidly such trains may be introduced into service. But, regardless of whether more trains are to be built in the near future, the operation of the present trains will supply maintenance-of-way engineers with basic data from which to determine the extent to which track surfaces and alignment must be improved to meet their more exacting requirements.

CURRENT NEWS

Expansion of PWA and Housing Programs Favored in Present Administration Plans

(Washington Correspondence)

EXTENSION and expansion of the program of public works and housing is in the forefront of administration planning for the coming year. Direct relief is to be discarded in the drive to create work. The program aims at another big drive to energize business to the point where it will move with its own momentum.

Proposals now under consideration reach a total of $5,000,000,000. Although this is not strictly in line with the curtailment of activities of public agencies which President Roosevelt discussed with the bankers, he stated at that time that such curtailment would be proportionate to the extent to which private agencies take up the slack. Since then Donald Richberg has condemned as invalid the demand for "a blueprint of the exact time and method for balancing the budget while emergency relief is a continuing and uncertain (even though a diminishing) obligation."

Private credit will be given an opportunity to help in carrying forward this federal program, or to put private dollars to work to curtail the Government's outlay. By its very magnitude as a new business stimulating force, the plan now forming indicates the administration's recognition that the Government cannot continue indefinitely to borrow money that does not earn a return.

Financing of program

The major features of the new program may be reimbursable but not strictly self-liquidating. Financing will be based on fairly long-term amortization at nominal interest rates. In the main, the money that has previously gone into direct relief will be diverted into useful employment of higher calibre than last winter's CWA program. The goal is definitely, as Mr. Richberg says, "a sounder economic program than a continuance of public expenditures principally in direct relief or unproductive relief work."

In pumping more public credit into business-creating projects, much emphasis will be put on quick timing. In fifteen months the PWA has actually disbursed more than $1,700,000,000 and still provides direct employment for close to 1,000,000 men, including CCC, TVA and administrative employees. However, the employment pick-up was so slow that it is already tapering off without having delivered a solid blow. If public works had done what was expected of it a year ago, private construction should now be on the increase and there would be curtailment in new outlays for public construction, whereas, in September, PWA jobs accounted for about two-thirds of the total contracts let.

PWA funds exhausted

The PWA has allotted its entire fund of $3,700,000,000 but $2,000,000,000 of this total has not been spent. On federal projects, including the budgets of various government agencies the unspent allotments total $1,200,000,000 and on non-federal projects the total is nearly $800,000,000. Practically all federal construction projects are now under contract or have been started by force account. Out of a total of $998,000,000 allotted for non-federal projects, $6,000,000 has been spent on completed projects, $622,000,000 is under construction, $23,000,000 more is under contract and $32,000,000 is being advertised for bids.

The PWA is continuing to make allotments for new projects out of $150,000,000 released by the rescission of allotments for 683 projects. Resale of municipal bonds purchased by PWA as security for its loans will finance more construction, but only $13,000,000 has been derived from this source to date. Employment on PWA financed construction projects reached a peak in August when 624,000 men were on payrolls totaling $35,000,000 a month. With the tapering off, principally of road construction, the number employed in September dropped to 550,000 but the payroll still approximates $35,000,000. Material orders that through September total about $500,000,000, have created a substantial volume of secondary employment, but it is small when compared to relief rolls.

New construction plans

The new construction program is designed to absorb the coming winter's relief load and carry on public works before the present PWA program slacks off materially next year. Housing, both urban and rural, that to date has been largely experimental, will probably rank higher than public works in the new program. Railroad construction will be projected into extensive grade separation and elimination work to be financed in a manner that will relieve the carriers of a much larger proportion of the cost.

Both federal and non-federal construction of public works will continue, with a larger proportion of federal construction set up on a reimbursable basis than in the past. All government departments and agencies now are submitting a schedule of projects that run into big figures. A heavy backlog of non-federal projects is waiting for allotment. Approximately 1,800,000 persons now on relief rolls are employed irregularly on work relief projects that followed termination of CWA. Since then FERA and state relief administrations have canvassed the country for high grade projects and have scheduled a vast amount of work that can be undertaken immediately.

Combining all types, the programming now under way is designed to lift construction to a substantial percentage of normal volume. Coordination of all phases of this work under Harry Hopkins is rumored in Washington. Most of the preliminary planning that is bringing together the proposals from inside and outside the Government is heading up in FERA.

Hetch Hetchy Aqueduct Opened With Appropriate Ceremony

Attended by thousands of San Franciscans and city officials, the opening of the Hetch Hetchy Aqueduct was celebrated on Oct. 28. Secretary Ickes was the speaker of the day. The mountain water, flowing through the 155-mile aqueduct by gravity, was turned in local storage reservoirs immediately south of the city at exactly 3 p.m. The event marked the completion of the $100,000,000 water-supply development, which has been under construction for twenty years. All phases of this undertaking were reviewed in a special issue of *Engineering News-Record*, Aug. 2, 1934.

New York Professional Engineers Join National Society

The New York State Society of Professional Engineers has accepted a charter membership in the National Society of Professional Engineers. This action was taken at a meeting of the board of directors of the state society, October 26, by a unanimous vote, following authorization obtained by a referendum of the membership of the society, which indicated 457 in favor of affiliation and 15 opposed.

The directors of the state society also approved the transfer of the monthly publication of the society, *The American Engineer*, to the national body as of January, 1935.

Arnold G. Chapman, president of the New York state society, was named representative and director in the national society.

Second Federal Housing Project Announced for Chicago

Acquisition of 35 acres of land on the South Side of Chicago for a second PWA housing project site, was begun last week in condemnation proceedings filed by the Department of Justice in the United States District Court in Chicago. It is estimated on the basis of preliminary surveys that the cost of the project will approximate $7,000,000. The sum of $25,000,000 has been earmarked for the Chicago program. The first project, announced a few weeks ago, provided for a 37 block development for the near Southwest section at a cost of about $12,500,000.

The area named in the latest proceedings is bounded by South Parkway, 37th St., Cottage Grove Ave., 38th St., Langley Ave., and 39th St. (Pershing Road). The project will be for Negro occupancy. The site is now occupied by dwellings in advanced stages of disrepair, with inadequate sanitary facilities. It also contains the site of the proposed Madden Park, title to which is held by the Chicago Park District. The proposed park area has been exempted from the condemnation proceedings.

Preliminary plans for the project call for the use of three-story apartment buildings, to occupy 30 per cent of the site. It is estimated the project will provide housing for upwards of 1,400 families.

Termination of Large Contract Demanded by PWA

ACTING on evidence of faulty construction, repeated violations of plans and specifications and failure to meet other PWA requirements, the Public Works Administration has demanded immediate termination of the subway construction contract between the Delaware River Joint Commission and Builders, Inc., of Philadelphia. In taking this action, PWA exercised its authority reserved in the loan-and-grant agreement covering allotment of $11,681,000 to the commission for the construction of a high-speed electric-rail transit line across the Delaware River Bridge between Philadelphia and Camden.

In a letter to the commission on Oct. 30, Major Philip B. Fleming, acting deputy administrator, also demanded that under the loan agreement with PWA the commission withhold from Builders, Inc., the sum of $25,000 to pay laborers and mechanics the difference between the rate of wages required by the construction contract and the rate actually paid by Builders, Inc.; and that, also pursuant to the loan agreement, the commission take immediate steps to reorganize its engineering supervision and inspection staff in a manner satisfactory to PWA.

The commission was given 24 hours in which to notify PWA of its intention with respect to the demands and at the time of going to press there has been no information as to the answer. Failure to comply, the acting deputy administrator said, will compel PWA to refuse to take up any bonds and to make any further payments of the grant, and may lead to termination of the loan agreement. Copies of the deputy administrator's letter were sent to the several surety companies on the bond of Builders, Inc.

The contract calls for a lump-sum payment of $998,394 for the construction of a subway in Philadelphia from Eighth and Race Sts. to Sixth St. and an underpass in Fifth St. PWA engineer-inspectors in Philadelphia already have rejected part of the work of Builders, Inc., and have sent evidence to Washington charging failure on the part of the company to follow plans and specifications, to abide by PWA regulations, and in other respects to carry out its contract. The engineer-inspectors charge specifically the improper placing of concrete and violation of specifications with respect to placing the backfill.

Conditions objected to early in September still exist, according to the report. Repeated warnings have been ignored, the inspectors reported, and concrete, the quality of which is questioned, has been placed in a careless manner so that the dense watertight mixture required by the specifications has not been obtained.

Water Softening Equipment To Be Installed at Little Rock

Water softening equipment, to cost $65,000, will be installed by the Arkansas Water Co., to improve the supply of Little Rock, Ark., following the approval of a plan of treatment by state sanitary officials. The new treatment will supplement the present filtration plant.

Seven More High-Speed Trains to be Built with PWA Funds

PWA loans totaling $2,270,000 provide for building seven more high-speed trains, by five major railroad companies. These trains are scheduled for operation next spring, and in many respects will be similar to the new Union Pacific streamlined train which established the new 56-hr. 55-min. transcontinental record on October 25 and the Burlington's Zephyr.

The B. & O. will assemble equipment into two trains, one powered by a streamlined steam engine, and the other by a diesel electric engine, to secure a direct comparison of operating costs and service. A loan of $350,000 to the Gulf, Mobile & Northern Railroad Co. will be used to test the relative merits of the articulated type of light-weight train and the separate car type. This company has ordered its equipment in separate units: two motor units, three passenger cars, and two combination sleeping and observation cars. The study of this equipment is intended to answer the objection which has been raised against the use of articulated trains which must be taken out of service to make repairs to any single unit.

The New Haven and the Boston & Maine have both ordered articulated trains. The PWA financing for these two trains is about $500,000. The Illinois Central has also received a loan of $500,000 for a high-speed train, but the order has not yet been placed.

Chemical Treatment Favored for Twin Cities' Sewage

Seventy-per cent sewage treatment is considered by the engineering board to be sufficient to meet state board of health requirements for the condition of the Mississippi River below the discharge of the proposed sewage-treatment works of the Minneapolis-St. Paul Sanitary District. Plain sedimentation and chemical precipitation are the recommended methods to obtain the 70 per cent result, but the engineering board appointed by the district last July to determine the extent and method of treatment desires to have its findings reviewed by "one or more consultants of long and varied experience in sewage treatment." A preliminary report carrying these recommendations was presented to the trustees Oct. 29. The engineering staff of the district concurs in the recommendations of the engineering board, which consists of Colonel C. W. Kutz, chairman, Prof. Frederic Bass and W. N. Carey, state PWA engineer.

The treatment plant to be built for the Twin Cities will provide for a flow of 134 m.g.d. Three schemes were studied by the board: plain sedimentation plus chemical precipitation, activated-sludge treatment for 40 m.g.d. and plain sedimentation and chemical precipitation for the remainder, activated-sludge treatment for 84 m.g.d. and plain sedimentation alone for the remainder.

An abstract of the board's recommendations will appear in an early issue of *ENR*.

Fundamental Questions of Planning Stressed at St. Louis Conference

WIDELY varying phases of city, regional, county, state and national planning were discussed in the three-day session of the National Conference of City Planners and the American Civic Association, at St. Louis, Mo. on October 22-24. Among the topics of especial interest to the engineer were: Economic value of planning, politics and planning, obtaining public support for plans, land use planning, area planning, population trends and decentralization problems.

The great Michigan Avenue improvement in Chicago was directly a result of the Burnham plan, said H. P. Chandler, Chicago Regional Planning Association. After it had come into use traffic across the Chicago river at that general location increased from 9,720 vehicles daily over the old Rush Street narrow way to 85,000 per day over the new bridge at the present time. Retail establishments migrated northward as far as a mile beyond the river and tax valuations along Michigan Avenue increased twelve times. Nevertheless, Mr. Chandler said, we err if we evaluate benefits of city planning on too practical lines, for the gains resulting from such improvements are frequently to the city as a whole rather than to the immediate locality only.

Mr. Chandler also referred to the advantages of early planning of wide highways, which give opportunity to acquire right of way at lower cost. In the Chicago region some 250 miles of right of way have been acquired by dedication, aggregating 3,300 acres which had a value in 1932 of $850,000.

The startling statement was made by Mr. Chandler that of the 1,955,000 recorded building lots in the Chicago region, roughly lying within a 50-mile radius, more than 1,000,000 are vacant. Of the 740,000 lots in Chicago proper there are still 30 per cent vacant. There are blighted areas in Chicago aggregating 30 square miles in which the population has decreased 128,000 since 1920.

St. Louis population

Harland Bartholomew, of St. Louis, indicated that St. Louis has had a sustained interest in planning for thirty years. He outlined the various plans that have been made for city, county and metropolitan regions.

Like other metropolitan centers St. Louis is losing population at its center and gaining it in the outskirts. Outlining the probable future distribution of population, estimated to increase at 14½ per cent a decade, Mr. Bartholomew said most of it would be within a 5-mile circle, with the smallest population within the first mile. Within a two-mile range the population has decreased 100,000 in the last twenty years. The area between the 10- and 15-mile circles is expected to increase in population from 6,250 in 1930 to 320,000 in 1960.

Mr. Bartholomew stated that studies of land use indicated that agencies should be set up in each state to govern and control industrial and urban development locations through zoning for rural areas.

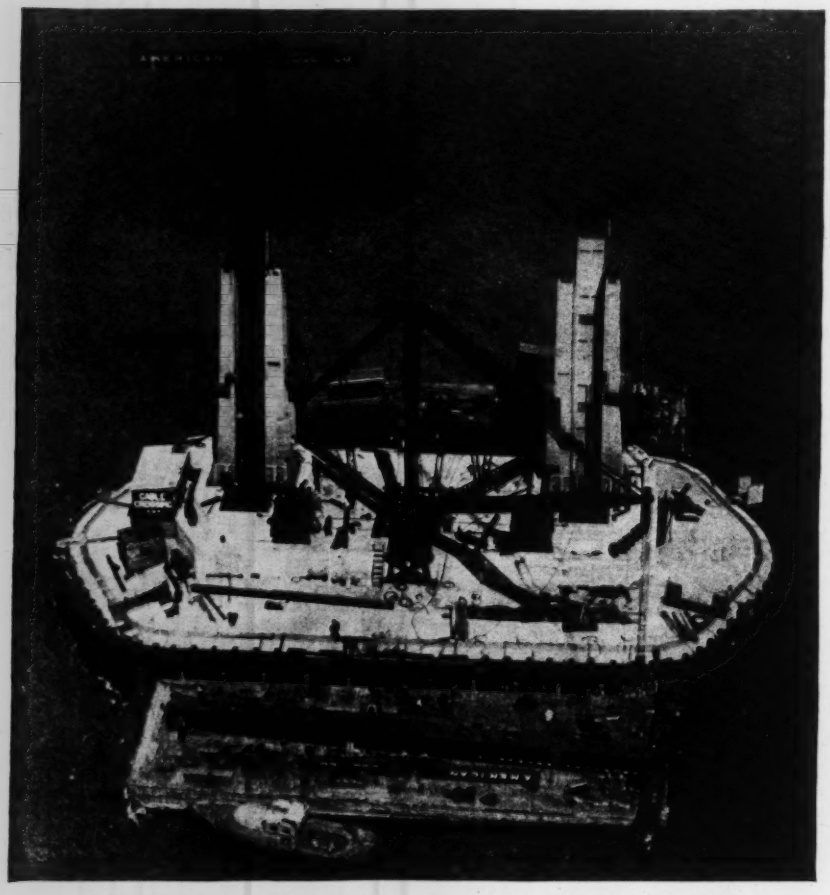
Of the larger planned areas the TVA today is the most studied. Earle S. Draper, director of land planning and housing, contended that city planning has suffered from

(Continued on p. 571)

Foundations Finished After 18 Months' Work On San Francisco-Oakland Bay Bridge

UNIFORMLY good progress has been made by contractors on the San Francisco-Oakland Bay Bridge which has now been under construction for 1½ years and foundations are practically complete and steel erection well started. It is contemplated that the stringing of wire in the suspension cables on the twin west crossing spans will begin about Feb. 1, 1935.

The west bay crossing is in reality two halves, each a complete suspension bridge, separated by the central anchorage pier (*ENR*, March 22, 1934, p. 374). The cable spinning, which is estimated to require about a year, will be done first to the west of the center anchorage and later on the eastern half. While spinning on the eastern half is under way suspenders will be attached to the cables on the west half and stiffener trusses will be raised to place. To maintain uniform loading, truss sections will be placed first at the center of the west center span and at the anchorage ends of the side spans. From these points erection will proceed simultaneously toward the towers. The same sequence will be followed later when truss erection is begun on the similar suspension span east of the central anchorage pier.



ASSEMBLING the hammerhead cranes used for tower erection. The stiff leg derrick has set the base sections of the tower on Pier 6 in the west bay crossing and is shown erecting the two hammerhead cranes which will complete the tower to a height of 474 ft. above water level. This pier rests on rock at El. — 180.

In the West Bay crossing all the piers are above water level and all but the center anchorage have been completed up to the base for the structural steel. Steel-tower erection in the west bay has been proceeding rapidly, the hammerhead derricks, developed by the Columbia Steel Co. for this job, according to C. E. Andrew, bridge engineer, are "superior to the creeper type of derricks ordinarily used for erection of this sort and the towers are going up so fast the shops are barely able to keep up with the erection crews." Each of the four west bay towers calls for about 5,000 tons of steel; three towers are now complete and the fourth is scheduled for completion before the end of this year. Total amount expended on the work to date is about $19,000,000.

On the East Bay crossing all but two of the piers have been completed and these are scheduled to be finished by Nov. 30, 1934. Erection of structural steel westward from the east bridgehead is well under way; five 290-ft. spans have been erected to date. The cantilever principle is being employed on the East Bay crossing, making use of one falsework bent at the center of each span.

A feature of the east approach is the long earthfill paralleling the Key Route mole. This was constructed by first excavating the soft mud from the site, the depth of excavation varying from 5 to 20 ft., and then pumping in about 1½ million cu.yd. of sand by suction dredge delivering through a 24-in. discharge line. The rate of depositing this material at times was in excess of 25,000 cu.yd. per day or more than 1,000 cu.yd. per hour.

Suit Filed Against Contractor for Non-Payment of Code Fee

The New York Code Authority for Mason Contractors' Division (Chap. VIII) has brought action in the New York City Municipal Court against John Lowry, Inc., general contractor, for code assessment fees in connection with masonry work on the Italian Building of the Rockefeller Center group. The Lowry company, which did its own masonry work on the building, contends that under various rulings it is not required to pay code fees to the Mason Contractors' Authority, having already paid a fee covering the masonry work to the General Contractors' Authority on the general contract price. The amount of fee in dispute is reported to be about $3,000.

Early in June the Mason Contractors' Authority requested all general contractors in New York to file estimates of the cost of masonry work intended to be done by the general contractors. This request was refused by the general contractors, acting through the General Contractors' Divisional Code Authority. Their stand was later upheld by a ruling by Administrator Johnson, No. X-36, providing that no firm would be liable for more than one code fee, that to be paid to the code authority having jurisdiction over the firm's major activity.

A demand was made on the Lowry company by the Mason Contractors' Code Authority for code fees for the masonry work on the Italian building. Lowry refused to pay, and at a hearing before the New York Compliance Director of NRA, contended that the X-36 ruling exempted him. Lowry pointed out that his firm seldom sublet masonry work on any of its jobs, and regarded the masonry as part of the general contracting work. Without making a decision, the matter was referred by the Compliance Director to Washington.

Before the Washington administration acted on the case, action against Lowry was brought by the Mason Contractors' Code Authority in the Municipal Court. An appeal to G. L. Berry, division administrator of the NRA, by the General Contractors' Code Authority resulted in an agreement to delay court action until a ruling could be made. On October 12 G. A. Lynch, Administration Officer of the National Industrial Recovery Board, issued an order interpreting Ruling X-36 as applying to the case, and held that general contractors doing their own masonry work would not be obliged to pay a code fee to the Mason Contractors' Code Authority. Upon receipt of this last ruling, the original court action against Lowry was reinstated in an effort to force collection of the fee.

Steel Fabricators Consider Their Business Problems

SUBJECTS relating intimately to the steel fabricating industry's problems comprised the program of the twelfth annual convention of the American Institute of Steel Construction held in Chicago Oct. 25 and 26. The industry's stand on its code, which it has refused to accept in the form desired by NRA, was reaffirmed and at the same time hope was expressed that some understanding with the federal government could be reached which would help in eliminating cut-throat competition. President Clyde G. Conley (Mt. Vernon Bridge Co.) called attention to an increase in tonnage, a larger percentage of the industry embraced in the Institute membership and an increased gross income over the previous year. He characterized price posting by the steel mills as a wholesome stabilizer and the elimination of rebates and secret concessions as a boon. He urged a closer integration of local with national objectives in the steel industry, to be obtained by closer cooperation between local groups and the Institute.

Technical accomplishments

During the year the publication of a second edition of the A.I.S.C. Manual was recorded. The Institute staff developed a design method for steel plate floors permitting the plate to act as the web of a transverse wind girder, thus eliminating sway bracing; in the case of self-anchored suspension bridges such a floor also could take compression. Formulas for steel rigid frame bridge design, developed by Weiskopf and Pickworth, consulting engineers, were put out in booklet form. In the matter of cooperative laboratory investigations, there were listed current beam connection tests at the College of the City of New York, tests of pin holes in steel plates at Columbia University, an investigation of concentrated live loads on flat steel plate floors and of the comparative values of various wearing surfaces on such floors at Lehigh University, and a model study of tall building bent action under wind at Ohio State University. During the past year the Institute has cooperated in the production of a manual of recommended practice for the flame-cutting of structural steel which will soon be published. Students' design competitions on steel bridges and the annual awards for the most beautiful steel bridges built during the year have been continued with notable success.

Industry conditions

Statistically, it was reported that shipments of fabricated steel for 1933 were 827,000 tons as compared with about 1,000,000 tons in 1932 and about 1½ million tons in 1931. For the first six months of 1934 shipments have been 418,687 tons, by 161 reporting companies. The composite financial statement for the industry shows that since 1928 earnings on sales have shown the following variations: 4, 3.8 and 1 per cent profits in 1928, 1929 and 1930, and 5, 9.5 and 3.4 per cent losses in 1931, 1932 and 1933. The Institute membership for the same period has been as follows for the respective years: 223, 219, 218, 195, 166, 178 and 174. The highest yearly income was $412,500 in 1930. The lowest income was $110,800 in 1933. For 1934 the Institute's net income will be $127,000.

Housing

The annual banquet following the convention was addressed by Horatio B. Hackett, head of the PWA Housing Division, Colonel Hackett issued a challenge to the industry to cooperate with the government in its housing work. "We need cheaper and more durable materials," he said, "in our low cost housing program and if the steel industry can produce them, we will use them, but up to this time we have found little on the market in the way of steel building material suitable to our needs which we can use. The Housing Division is not opposed to innovations in building. However, no industry can expect us to be a laboratory for the testing of untried, unproven products." He emphasized that each industry must develop and successfully market its products before the government could be persuaded to consider them.

City Planners Discuss Problems

(Continued from p. 569)

"final" and "master" plans. He illustrated the point with the instance of a recently built million dollar highway bridge which will be submerged 20 ft. or more by dam construction, and by the flooding of new highway locations. In the TVA an attempt is being made to bring all factors of the development into proper balance. To this end cooperation is being sought of geographers, agriculturalists, economists, sociologists and foresters as well as civil engineers, landscape architects and housing experts.

In the "Mid-American" area, which consists of Minnesota, Wisconsin, Michigan, Iowa, Illinois and Indiana, J. L. Crane presented a new concept of a region. This area comprises 11 per cent of the total area of the country and contains 19 per cent of the total population. Mr. Crane predicted an increase in population to 30,000,000 in 1960, representing an increase of 5,000,000. The forces are operating, Mr. Crane said, to concentrate population in about a dozen metropolitan centers. These should be planned and built to meet the expected development.

The simple suggestion to put 10,000,000 idle men on 100,000,000 idle acres does not solve the unemployment problem as easily as it might appear, said L. R. Schoenmann, regional director, land policy section, Agricultural Adjustment Administration. Idle lands usually are poor, and there are too many farmers already. Further, there are numerous human factors operating as obstacles to the success of tnis plan.

The shifting of population due to poor lands is a serious problem and should not be turned over to relief agencies who know little of the problem's intricacies, said Noble Clark, also regional director, land policy section of the A.A.A. Mr. Clark's suggestion was that a federal aid program be set up similar to the federal aid road fund. The federal organization should restrict its activity to a minimum and the program should be administered locally.

Part of Fort Peck Spillway Work Awarded, Remainder Readvertised

Contract for Schedule 2, Second Priority, Fort Peck dam spillway, was awarded October 26 by the Division Engineer, U. S. Engineer Department, Kansas City, to Martin Wunderlich, Jefferson City, Mo., for $1,168,120. Work on this priority, all at the north end of the spillway, involves 2,750,000 cu.yd. of overburden and shale excavation and 12,000 squares of waterproofing. The remainder of the spillway work, for which bids were opened September 24, has been readvertised for bid opening on November 12. Principal items in the remaining work are 10,550,000 cu.yd. of excavation, 106,000 squares of waterproofing and the concrete structures. Wunderlich bid only on the work he was awarded. Failure of the two lowest bidders on the entire schedule to secure bond is reported as the reason for readvertising Priorities 1, 3 and 4.

Bids Asked for Hydraulic Dam in Massachusetts

Bids will be opened by the Metropolitan District Water Supply Commission at Boston on Nov. 13 for the construction of the 2,100,000-cu.yd. hydraulic fill for Quabbin Dike, part of the District's development of the Quabbin Reservoir near Ware, Mass. Under a previous contract a concrete cut-off wall, consisting of a series of pneumatic caissons, was built across the valley floor (*ENR*, Aug. 24, 1933, p. 215). The main dike will be about 1,800 ft. long with a maximum height of about 120 ft. The contractor will be permitted to place the fill by the full hydraulic method, or by the semi-hydraulic method of hauling to a hog box and sluicing the fill to place.

Frank Julian Sprague Dies; Developer of Electric Railroads

Frank Julian Sprague, builder of the first successful electric street railway in the United States and closely associated with the development of the electric traction industry, died at his home in New York City Oct. 25 at the age of 77. Through his establishment of the original electric street railway system in Richmond, Va., in 1887, and subsequent inventions and developments in this field, he had been looked upon for many years as the "father of electric traction."

Mr. Sprague was born at Milford, Conn., in 1857, and graduated from the Naval Academy in 1878. In 1883 he resigned from the Navy to devote his attention to electrical work, and the following year he became an assistant of Thomas A. Edison. He left Edison the same year to organize the Sprague Electric Railway & Motor Co., and carried forward the development and manufacture of electric motors. In 1887, Mr. Sprague carried his experimental work to the point of contracting to equip the Richmond electric trolley system, the first in this country. During the following years he equipped and installed electric railway systems in this country, and in European cities, aggregating more than 100. In 1890 the Sprague Company was absorbed by the Edison General Electric Co.

He was a member of the Am. Soc. C. E. and the A. I. E. E., serving as president of the latter organization in 1892-93.

SOCIETY CALENDAR

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, annual convention, Santa Fe, N. Mex., Nov. 12-15.

INTERNATIONAL ACETYLENE ASSOCIATION, annual meeting, Pittsburgh, Nov. 14-16.

HIGHWAY RESEARCH BOARD, annual meeting, Washington, D. C., Dec. 6-7.

AMERICAN ROAD BUILDERS, annual convention, Washington, D. C., Jan. 22-25.

CANADIAN CONSTRUCTION ASSOCIATION, annual convention, Montreal, Que., Jan. 29-31.

MISSOURI VALLEY SECTION, American Water Works Association, Omaha, Neb., Nov. 8-10.

NORTH CAROLINA SECTION, American Water Works Association, Elizabeth City, Nov. 12-14.

NEW YORK SECTION, American Water Works Association, New York City, Dec. 27.

NEW ENGLAND SEWAGE WORKS ASSOCIATION, at annual meeting Oct. 15 elected Prof. Gordon M. Fair, Harvard Engineering School, president, Guy E. Griffin vice-president and F. W. Gilcreas secretary-treasurer for the next year.

Personals

DAVID H. TULLEY, First Lieut. Corps of Engineers, has been transferred from duty with NRA at Washington to duty as assistant to the district engineer at Louisville.

C. C. BONEBRAKE, city engineer and street superintendent of Orange, Calif., for the last twenty years, has resigned.

VERNE GONGWER, supervisor of hydraulic design and construction for Tacoma, Wash., in the public utilities department, left that city Oct. 20 to join the engineering staff of the Tennessee Valley Authority.

DAVID DAVIS, JR., who has been with the Pennsylvania Railroad for 19 years and division engineer of the St. Louis division for the past year, has been appointed division engineer of the Long Island Railroad with headquarters at Jamaica. JAMES M. FAIR, who occupied this position, has been promoted to the position of engineer, maintenance of way, of the Western Pennsylvania division with headquarters at Pittsburgh.

Obituary

HARRY HUNTLEY SHULTS, 46 years of age and president of the Shults Engineering Co., Buffalo, N. Y., died Oct. 23 while on a business trip to Binghamton, N. Y.

HERBERT E. MATHEWSON, construction engineer and builder of industrial plants in Rhode Island, died at his home in Galveston, R. I., Oct. 26. He was a graduate of Brown University and at one time was associated with the J. Herbert Shedd Engineering Co., Providence.

ROBERT DUNCAN COOMBS, mayor of Paramus, N. J., and president of R. D. Coombs & Co., engineers and contractors in New York City, died at his home in Paramus Oct. 22 at the age of 61. He was a graduate of the University of Pennsylvania in 1894, and was associated for several years with the Phoenix Bridge Co. and the Pennyslvania Steel Co. In 1910 he became vice-president of the Fitzpatrick & Coombs, Inc., and the following year organized R. D. Coombs & Co.

CONSTRUCTION STATISTICS OF THE WEEK

ENGINEERING awards for the week ending November 1 are the second highest for the year, $39,922,000. This includes contracts totalling $14,125,000, awarded by Los Angeles Metropolitan Water District for 110.62 miles of the Colorado River Aqueduct. In addition all classifications except bridges and highways are higher for the week. The public total is $34,107,000, of which $4,966,000 is federal and $29,141,000, state and municipal. Private awards total $5,815,000.

Highways at $6,481,000 are 15 per cent below last week and bridges at $1,380,000 are 20 per cent below a week ago. Other classes of work are waterworks, $15,000,000, sewerage, $1,996,000, earthwork, irrigation, drainage and waterways, $3,405,000, commercial buildings, $1,804,000, industrial buildings, $3,419,000, public buildings, $5,274,000.

Larger awards for the week include: cold-rolling mill for Youngstown Sheet and Tube Co., $2,500,000; buildings at Fordham University, New York, $500,000, Geo. Washington high school, San Francisco, $735,000; South Boston School, Boston, $642,000; buildings at New Jersey State Hospital $901,000; state highways by Nebraska $762,000; Colorado River Aqueduct, California, $14,125,000; two incinerators, Pittsburgh, $730,000; dredging Houston Ship Channel, U. S. Engineers, Texas, $546,000; 3 turbines for Norris Dam, TVA, $800,000.

State and municipal bond sales for the week total $7,911,000.

CONTRACTS

(Thousands of Dollars)

	Weekly Nov. 1933	Average Week Prev. 4 Weeks	Nov. 1 1934
Federal Government	$10,554	$ 3,034	$ 4,966
State and municipal	14,238	15,844	29,141
Total public	$24,792	$18,878	$34,107
Total private	4,739	3,747	5,815
Week's total	$29,529	$22,625	$39,922
Cumulative to date:			
1933	$852,492	1934	$1,082,951

NEW PRODUCTIVE CAPITAL

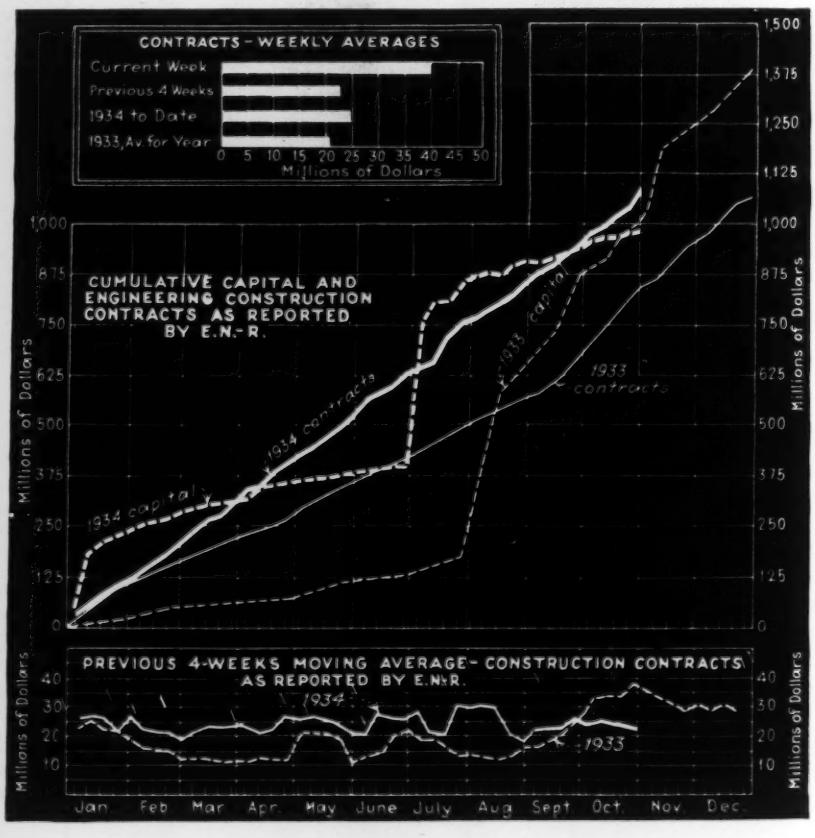
(Thousands of Dollars)

1934	Week Oct. 25	Cumulative
State and municipal	$7,911	$282,285
PWA allotments, S&M	—10	606,863
RFC loans, S&M	....	25,463
Corporate issues	....	18,256
PWA allotments, private	....	57,022
Total, Non-Federal	$7,901	$989,889
PWA allotments, Federal Constr.	...	193,525
Total new capital	$7,901	$1,183,414
Cumulative to date:		
1933	$1,032,428	1934	$989,889

Note: These figures include private bonds, and stocks sold for productive purposes; state and municipal bonds for construction; PWA loans and grants to states and municipalities, including the special highway funds; PWA private loans, and allotments for Federal construction.

INDEX NUMBER

E.N.-R.- Cost	1913 = 100	1926 = 100	E.N.-R.- Volume	1913 = 100	1926 = 100
Nov., 1934	201.36	98.76	Oct., 1934	98	43
Oct., 1934	200.86	96.55	Sept., 1934	101	44
Nov., 1933	190.14	91.40	Oct., 1933	162	71
1933 (Av.)	170.18	81.80	1933 (Av.)	102	45
1932 (Av.)	156.97	75.45	1932 (Av.)	127	56
1931 (Av.)	181.35	87.17	1931 (Av.)	220	96.5



Construction Equipment and Materials

Road Roller with Auxiliary Roll Eliminates Waves in Pavement

The Hercules Co., Marion, Ohio, announce their Hercules Ironer Roll, an attachment for their three-wheel rollers. This ironer roll is an auxiliary roll of small diameter mounted in place of and interchangeable with the scarifier. It is hydraulically operated, roller bearing mounted and has great flexibility in its operation,

Hercules Ironer Roll

having a range from minus 6 in. to 6½ in. above grade, and hydraulic pressure range from zero to 300 pounds.

In operation, a weight corresponding to more than half of the total weight of the entire roller may be exerted on this auxiliary roll, and as the small diameter of the roll provides a shorter arc of contact with the material being rolled, better compaction is obtained, high spots are eliminated and uniformly level surface obtained.

The manufacturer states that by placing this auxiliary roll at the rear of the three-wheel roller, a perfect plane is obtained about 17 feet long. This long plane surface eliminates short waves in the road surface.

New Equipment in Brief

Steel Floor. Truscon Steel Co., Cleveland, Ohio, announces the Truscon Safety-Tred for steel floors. It is supplied in plates, blocks or planks.

Air Compressor. Sullivan Machinery Co., Chicago, Ill., announces its new type WK60 portable air compressor. This new compressor is a two-stage machine of the V type with the air end air cooled. The compressor is provided with a new Wafer valve of large port area.

Diesel Tractor. The Cleveland Tractor Co., Cleveland, Ohio, has announced the Cletrac 35 diesel, which delivers a maximum of 46 hp. at the drawbar. The engine is of the same general construction as that used in the Cletrac diesel 80. It is equipped with electric starting.

Trailer. The C. R. Jahn Co., Chicago, Ill., distributors of the LaCrosse heavy duty trailer, announce that the pneumatic tired models of this trailer will now be equipped with a new type of tire. The tires are heavy duty, 10 ply, and have a capacity of 3,600 lb. The diameter is less than 30 in.

Hand Shovel. The Wood Shovel & Tool Co., Piqua, Ohio, has announced a new closed back shovel. Instead of the usual hollow in the back of the blade, there is a steel plate welded securely to the blade and extending up into the socket. By this construction the blade is made smooth both front and back.

Excavator. Announcement is made by the Harnischfeger Corp., Milwaukee, Wis., of a new mechanical tripping device for power shovels. It replaces the trip lever in front of the operator, the dipper trip now being mounted on the hoist lever. It is not necessary for the operator to remove his hand from the hoist lever to empty the dipper.

Portable Planer. The Black & Decker Mfg. Company, Towson, Md., has announced a portable electric rotary planer. It consists of a heavy-duty driving unit and two planer heads, one for gouging and one for surfacing. The maker states that it is adapted for smoothing and fitting joints in concrete forms; rough surfacing wood floors, decks, boat hulls, and piers; beveling and shaping planks, beams and other heavy timber.

New Publications

CATERPILLAR DIESEL FIFTY, Caterpillar Tractor Co., Peoria, Ill., 8½x11, 48 pages.

I-BEAM-LOK, Carnegie Steel Co., Pittsburgh, Pa., 8½x11, 24 pages.

A BETTER PORTABLE COMPRESSOR, Ingersoll-Rand, New York, N. Y., 8½x11, 12 pages.

BYERS GENUINE WROUGHT IRON PLATES, A. M. Byers Co., Pittsburgh, Pa., 8½x11, 16 pages.

STROCO WELDING RODS AND ELECTRODES, 4x9, 16 pages, Rich Manufacturing Co., Ltd., Los Angeles, Calif.

Business Notes

INDEPENDENT PNEUMATIC TOOL COMPANY has announced the election of W. A. Nugent as vice president in charge of sales and the election of Neil C. Hurley, Jr., as secretary.

OTTO KAFKA, INC., New York, N. Y., announces the appointment of Frank Kelly as manager of the order and traffic department. W. C. Hays and C. H. Brushaber have been elected vice presidents.

INDUSTRIAL BROWNHOIST CORP., announces the resignation of Alexander C. Brown as president and treasurer. Mr. Brown is to become first vice-president of Cleveland Cliffs Iron Co. but will continue as director of the Industrial Brownhoist Corp. Melvin Pattison, formerly executive vice president and secretary, has been elected president and treasurer of the company.

Power-Driven Road Finisher With Surface Vibrator

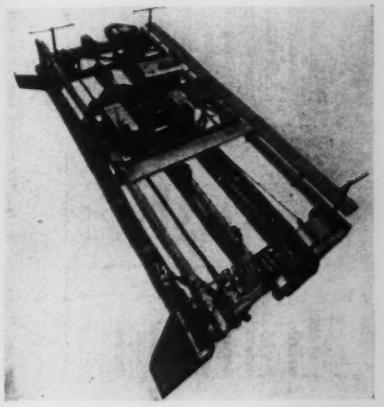
A power-driven road finisher equipped with a surface vibrator has been announced by the Blaw-Knox Co., Pittsburgh, Pa. The machine is 20-ft. wide and is driven by a gas-electric power plant. The machine is also equipped with a double screed.

The vibrator attachment consists of two independent 10-ft. units, each operated with an independent motor drive. Each of the vibrators is equipped with two vibrating elements. All controls are located at the center of the machine.

The front screed of the finisher is arranged for striking off the concrete at an adjustable height above the top of the side forms to provide the required excess of concrete to be compacted by vibration. With the first trip, the concrete is struck off with the front screed and simultaneously vibrated down to the level of the top of the form. The pavement is then double-screeded in the conventional manner.

The frequency and amplitude of vibration are adjustable over a wide range to suit varying concrete mixes.

Road finisher with surface vibrator



BUSINESS SIDE OF CONSTRUCTION

State and Municipal Awards Up; Federal and Private Lower

ENGINEERING construction in October reached the total of $90,501,000 compared with $94,439,000 a month ago and $141,622,000 a year ago. The drop from last year is in federal and private awards. State and municipal awards at $63,376,000 compare with last month at $60,082,000 and October a year ago, $58,007,000, federal awards at $12,136,000 compare with $17,024,000 a month ago and $60,672,000 a year ago while private at $14,989,000 compares with $17,333,000 last month and $22,943,000 last year. The total for the month drops 4 per cent below last month and 36 per cent below last year. The cumulative volume for the year, $1,043,029,000 is 27½ per cent ahead of last year.

Highway awards for the month are slightly higher than in September, $28,712,000 compared with $26,410,000, but are running below last year. Public buildings at $15,146,000 are 22 per cent below last month but double last October's total. Industrial buildings awards at $5,584,000 are 21 per cent higher than last month but about half of last October. Commercial buildings awards at $4,756,000 are approximately the same as last month and last year.

Territorially, Middle Atlantic and New England contracts are lower than last month, West of Mississippi, Far West, South and Middle West are higher than last month. All territories except New England are materially lower than last October.

New Capital

The municipal bond market which was quiet the first three weeks, came back stronger in the latter part of the month. Total sales for the month are $20,088,000. Net additions to PWA allotments total $5,883,000 for non-federal work and $40,000 for federal projects. RFC loans total $16,000,000.

Material Notes

Steel—The operating rate of steel companies having 98.7 per cent of the steel capacity of the industry averaged 23.8 per cent for October as reported by the American Iron and Steel Institute compared with 22.6 per cent for the corresponding weeks a month ago.

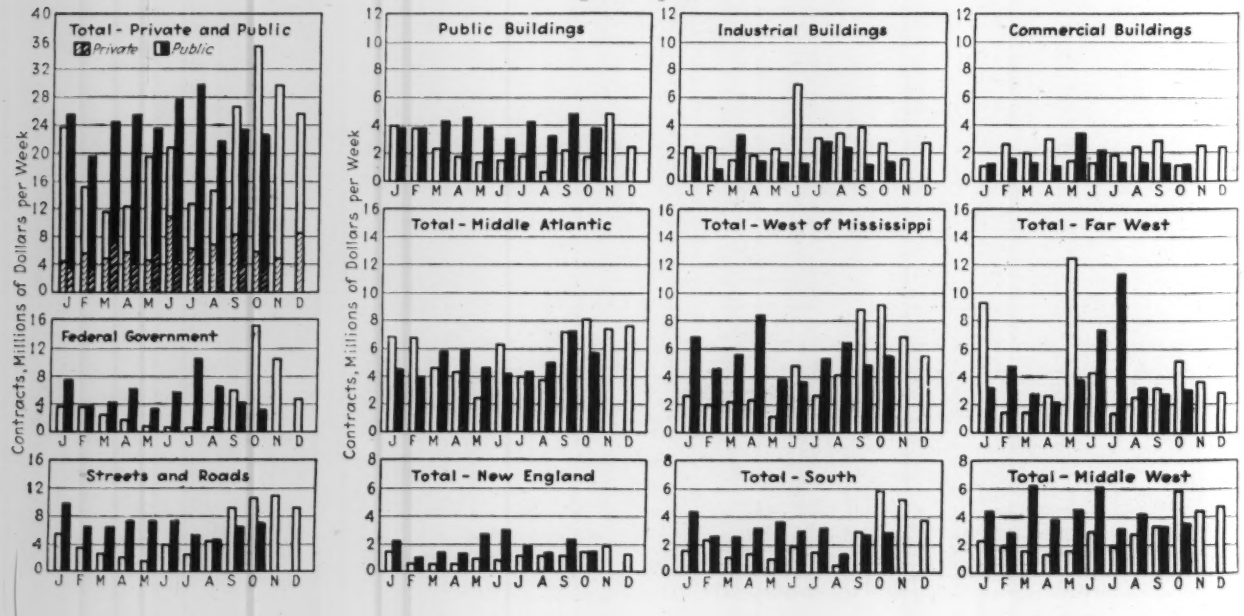
The American Institute of Steel Construction reports that September bookings were less than half the average monthly bookings during the first half of this year and nearly 40 per cent less than for this same month last year. Shipments, however, continued to run heavy, being 26 per cent larger this month than during September

ENGINEERING CONSTRUCTION CONTRACTS REPORTED IN OCTOBER, 1934

Four Weeks—Thousands of Dollars (000 omitted)

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States October 1934	United States Ten Months 1934	United States Ten Months 1933	Canada October 1934
Public Works										
Waterworks	326	465	409	898	1,500	444	4,042	57,353	62,877	40
Sewerage	149	1,772	737	1,238	1,686	69	5,651	48,987	14,194	...
Bridges, public	524	1,519	190	796	4,953	78	8,060	77,963	68,319	...
Earthwork and waterways	257	753	3,066	2,399	362	1,481	8,318	148,036	99,071	993
Streets and Roads	858	7,835	4,829	5,251	6,328	3,611	28,712	291,991	196,330	1,135
Buildings, public	1,626	4,151	1,953	2,359	2,551	2,506	15,146	166,152	87,630	...
Unclassified, public	400	2,756	44	83	703	1,597	5,583	54,323	17,153	117
Total public	4,140	19,251	11,228	13,024	18,083	9,786	75,512	844,805	545,574	2,294
Federal gov't. (included in other classifications)	510	1,362	3,433	2,842	1,454	2,535	12,136	230,589	145,305	...
Private										
Bridges, private	.....	6	.....	17	483	.....	506	9,693	12,204	...
Buildings, industrial	358	2,615	123	1,014	727	747	5,584	79,707	133,554	567
Buildings commercial	1,505	990	50	18	455	1,738	4,756	70,437	84,430	1,152
Unclassified, private	141	145	17	741	2,921	178	4,143	38,387	42,598	76
Total private	2,004	3,756	190	1,790	4,586	2,663	14,989	198,224	272,786	1,795
October, 1934 (4 weeks)	**6,144**	**23,007**	**11,418**	**14,814**	**22,669**	**12,449**	**90,501**	.....	.....	**4,089**
September, 1934 (4 weeks)	9,844	29,307	11,266	13,577	19,580	10,865	94,439	.....	.....	4,942
October, 1933 (4 weeks)	5,920	32,245	23,217	23,554	36,410	20,276	141,622	.....	.....	6,532
Ten months, 1934	83,164	222,520	127,113	186,255	235,571	188,406	.....	1,043,029	.....	38,637
Ten Months, 1933	43,862	231,166	82,861	109,330	169,256	181,885	.....	.....	818,360	26,853

CONTRACTS REPORTED—WEEKLY AVERAGES—1933-1934



last year, and while running larger than for any month during the first half of the year they were less than the shipments during either July or August of this year. Bookings ahead have declined accordingly. They are, notwithstanding, still larger than at this time last year. These figures are based on preliminary reports from 66 per cent of the industry.

Lumber—New business booked at the lumber mills during the third quarter of 1934 was 11.5 per cent below the production of the period, and 12 per cent below new business of corresponding weeks of 1933; shipments of the quarter were 2.5 per cent below production and 19 per cent below shipments of similar period of last year; production was 18 per cent below the third quarter 1933 record, according to report of the National Lumber Manufacturers Association from regional associations covering the operations of leading hardwood and softwood mills.

New business, shipments and production at the lumber mills during the week ended October 20, 1934, were all below similar items reported for any week since July and for the first time in the last four weeks, orders fell below those of corresponding week of 1933.

Evidence that the mid-July action of the Lumber Code Authority in reducing the industry's minimum cost-protection prices by 10 per cent had a direct effect upon the lumber market is seen in the preliminary August report of the United States Bureau of Labor Statistics, which shows lumber prices at a level of 81.8 per cent of 1926 levels, as against 86.3 in June and 85.3 in July. This reduced the bureau's average for all building materials, which dropped from 87.8 in June to 87 in July and 85.8 in August.

Labor

Employment in the production of six major construction materials as reported by Federal Employment Stabilization Office decreased in September. Using 1923-1925 as 100 the index with and without seasonal adjustment is: September, 1934, Unadj. 41.5, Adj. 40.2; August, 1934, Unadj. 42.6, Adj. 41.1; September, 1933, Unadj. 44.0, Adj. 42.7.

Employment in Building Construction in August reported by the Bureau of Labor Statistics is up 1.2 per cent with both payrolls and total man-hours worked up .3 per cent. These figures are based on returns by 10,949 firms engaged in public and private building-construction projects not aided by Public Works Administration funds. During the month ending August 15, 1934, over 602,000 employees were working at the site of Public Works Administration construction projects. This construction is financed wholly or in part from the Public Works Administration fund. These workers were paid more than $35,000,000 for their month's work. This compares with 612,000 persons working on PWA construction in July.

In New York State, employment in the construction industry increased almost 3 per cent from July to August. General building contractors and miscellaneous general contractors increased employment by 4 per cent and subcontractors by 8 per cent. Highway contractors employed fewer workers this month than last with consequent losses in payrolls and hours. Increases in payrolls and hours for general building contracting, miscellaneous general contracting and subcontracting were not as great as those reported for employment.

Of 88 industrial fatalities reported by the New York State Department of Labor for September ten, or 11 per cent of the total are charged to construction.

Employment in the construction industry moved forward in numerous Ohio cities during September, figures compiled by the Ohio State University Bureau of Business Research show. Akron led the list with an increase of 50.9 per cent over August in the number of men employed in construction activities. Employment in the construction industry there was 205.8 per cent over a year ago.

The Bureau of Labor Statistics in "Trend of Employment" for July, 1934, reports average hourly rates paid for work on highway projects financed from Public Works funds for month of July, 1934. These rates by occupations and geographical territory as compiled by the Bureau of Public Roads are reported in the accompanying table.

AVERAGE HOURLY RATES PAID FOR WORK ON HIGHWAY PROJECTS FINANCED FROM PUBLIC WORKS FUNDS, FOR MONTH OF JULY, 1934, BY OCCUPATION AND GEOGRAPHIC DIVISION*

(From Bureau of Public Roads)

Geographic Division	Occupation: Superintendents	Foremen	Shovel, elevating grader and crane operators	Other operators	Truck and tractor drivers	Teamsters	Skilled labor, carpenters, blacksmiths, and steel erectors	Unskilled labor	Average
	Average hourly rate								
New England	$0.88	$0.60	$0.92	$0.56	$0.48	$0.43	$0.59	$0.43	$0.49
Middle Atlantic	.93	.61	.86	.59	.51	.42	.67	.41	.48
East North Central	.94	.71	.88	.70	.61	.48	.70	.50	.58
West North Central	.77	.60	.73	.60	.52	.44	.61	.43	.49
South Atlantic	.70	.48	.69	.46	.38	.32	.45	.32	.36
East South Central	.68	.47	.72	.45	.37	.31	.41	.30	.35
West South Central	.72	.51	.72	.49	.40	.35	.54	.34	.40
Mountain	1.00	.76	1.06	.79	.67	.56	.80	.56	.66
Pacific	1.15	.82	1.18	.79	.72	.60	.79	.58	.71
U. S. Average Hourly Rate	.85	.61	.84	.61	.53	.43	.63	.42	.50
U. S. Total Employment									279,651
Employment, % of Total	1.5	5.7	2.8	4.4	15.7	4.4	9.0	56.5	100

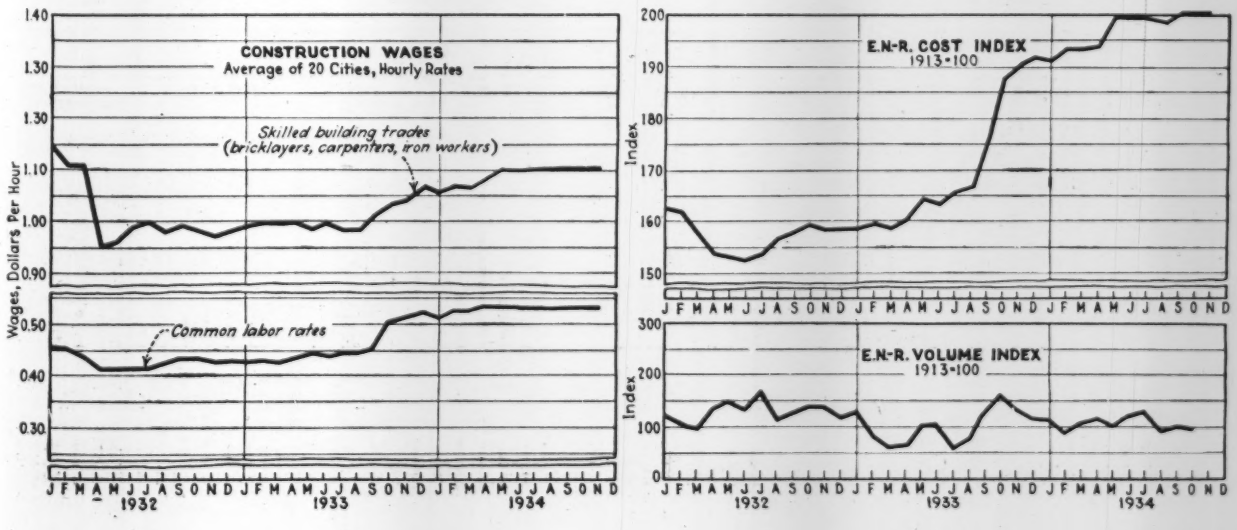
*Rates shown are based on 97 per cent of total employment for the month.

EN-R Cost and Volume Index

The *Engineering News-Record* Construction Cost Index for November is 201.36. This slight increase is due to an increase in the common labor wage rate average. The same situation on lumber prices exists as that reported September 6.

INDEX NUMBER

E.N.-R.-Cost	1913 = 100	1926 = 100	E.N.-R.- Volume	1913 = 100	1926 = 100
Nov., 1934	**201.36**	**96.76**	**Oct., 1934**	**98**	**43**
Oct., 1934	200.86	96.55	Sept., 1934	101	44
Nov., 1933	190.14	91.40	Oct., 1933	162	71
1933 (Av.)	170.18	81.80	1933 (Av.)	102	45
1932 (Av.)	156.97	75.45	1932 (Av.)	127	56
1931 (Av.)	181.35	87.17	1931 (Av.)	220	96.5



CURRENT PRICES OF CONSTRUCTION MATERIALS

CEMENT, AGGREGATES AND READY-MIXED CONCRETE—F.O.B. CITY

	PORTLAND CEMENT — Per bbl., carload lots, including 40c. per bbl. for bags, cash discount not included			SAND AND GRAVEL — Per ton, carload lots			CRUSHED STONE — Per ton, carload lots		CRUSHED SLAG — Per ton, carload lots, f.o.b. plant		CONCRETE — Ready Mixed 1:2:4, 50c per cu. yd. or more, delivered
	Cloth Bags*	Paper Bags	Bulk	Gravel, 1½ in.	Gravel, ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	
Atlanta	$2.79	$2.54	$2.34	$2.31	$2.31	$1.64	$1.69	$1.92	$1.80	$1.80	$9.00
Baltimore	2.66	2.41	2.21	1.80‡	2.00‡	1.25‡	1.80‡	1.80‡	2.25	2.25	7.35
Birmingham	2.55	2.30	2.10	1.75	1.75	1.40	.85	.85	.90	1.15	5.45
Boston	2.72	2.47	2.27	1.60	1.60	1.15	1.60	1.60	.....	.....	7.00
Chicago	2.85‡t	2.60‡t	2.40	2.60‡t	2.60‡t	2.05‡t	2.60‡t	2.60‡t	.....	.....	.....
Cincinnati	2.57	2.32	2.12	1.20	1.20	1.10	1.80	1.80	.....	.....	6.70
Cleveland	2.45	2.20	.....	1.55	1.55	1.45	1.60	1.60	1.75	1.75	8.85
Dallas	2.45	2.20	2.00	1.55	1.55	1.10	2.00	2.25	.....	.....	6.35
Denver	2.98‡	.....	.....	1.85	.....	1.25	.....	.....	.....	.....	.....
Detroit	2.25	2.00	1.80	1.15	1.05	1.00	1.10	1.10	1.30‡	1.30‡	6.00
Kansas City	2.45	2.20	2.00	.75p	.75p	.65p	1.30p	1.30p	.....	.....	7.00
Los Angeles	2.90	2.62	.....	1.90	1.90	1.40	1.90	1.90	.....	.....	6.70
Minneapolis	2.85	.....	2.40	1.00p	1.00p	.25p	1.00	1.00	.....	.....	6.90
Montreal	.....	1.70	.....	.....	1.50	1.40	.....	1.20	.....	.....	.....
New Orleans	2.47	2.22	.....	1.70	1.70	1.40	.....	.....	.....	.....	7.65
New York	2.90‡	2.65‡	.....	1.50†*	1.50†*	1.00†*	1.75†*	1.85†*	.....	.....	7.50
Philadelphia	2.60	2.35	.....	1.80‡	1.90‡	1.50‡	1.75‡	2.00‡	1.75‡	1.75‡	7.75
Pittsburgh	2.45	2.20	1.60	1.50‡	1.50‡	1.70‡	2.25‡	2.25‡	1.25	1.25	7.00
St. Louis	2.42	2.17	.....	1.25‡	1.25‡	1.25‡	1.71‡	1.71‡	.75§	.75§	7.50
San Francisco	2.72	2.52	2.20	1.35	1.35	1.35	1.50	1.50	.....	.....	7.55
Seattle	2.95	2.70	.....	1.50†	1.50†	1.50†	.....	.....	3.00	3.00	7.00

*10c. allowed for each returnable bag. †Per cu. yd. ‡Delivered. §F.o.b. Granite City, Ill. *Barge lots alongside dock. pf.o.b. plant. t5 tons or more.

CURRENT MAXIMUM NET PRICES RECEIVED AT CEMENT MILL

Charge for bags not included. For cloth bags, add 40c. per bbl.; 10c. refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable.

	Bagged	Bulk		Bagged	Bulk		Bagged	Bulk
Alpena, Mich	$1.65	$1.60	Ironton, Ohio	$1.60	$1.55	North Birmingham, Ala	$1.75	$1.7
Buffington, Ind	1.60	1.55	Iola, Kans	1.70	1.65	Richard City, Tenn	1.85	1.8
Crestmore, Calif	1.72	.....	La Salle, Ill	1.60	1.55	Saginaw, Mich	1.65	1.6
Dallas, Tex. (Inc. 5c. tax)	1.80	1.75	Limedale, Ind	1.60	1.55	Steelton, Minn	1.80	1.7
Hannibal, Mo	1.60	1.55	Mason City, Ia	1.70	1.65	Universal, Pa	1.65	1.6
Hudson, N. Y	1.75	1.70	Norfolk, Va	1.76	1.71	Waco, Tex. (Inc. 5c. Tax)	1.80	1.7
Independence, Kans	1.70	1.65	Northampton, Pa	1.65	1.60	Wyandotte, Mich	1.60	1.5

Cash Discounts, Cement, to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount, 10c. per bbl. for payment within 15 days of date of invoice.

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE — PARTITION — Per M, lots of 2,000 pieces or over,			STRUCTURAL CLAY TILE — LOAD BEARING — Per M, lots of 2,000 pieces or over,			BRICK — Per M, in quantity,		LIME — Per ton, in paper, carload lots		
	3x12x12 in.	4x12x12 in.	8x12x12 in.	8x12x12 in.	10x12x12 in.	12x12x12 in.	Common backing	Straight hard	Hydrated finishing	Common hydrated	Pulverized or lump
Atlanta	$84.27	$89.87	$168.40	$189.50	$243.20	$277.90	$13.22	$13.50	$17.50	$12.10	$12.10
Baltimore	77.50	82.50	154.00	185.00	216.00	267.00	13.00	17.00	16.50	11.00	19.00
Birmingham	84.25	90.00	156.00	180.00	215.00	242.00	15.00	22.50	3.00§	1.75§	2.25§*
Boston	85.30	91.15	171.00	193.50	239.60	273.40	14.50	17.00	17.89	13.05	3.06g*
Chicago	66.00	70.40	132.00	.....	.....	.....	10.20	11.20	18.00	13.40	14.00
Cincinnati	69.95	74.65	139.90	139.90	174.65	199.20	17.50	17.50	15.97	12.48	.....
Cleveland	62.50	66.50	124.50	149.50	188.00	214.75	16.50	16.50	17.20k	14.50k	2.65kp*
Dallas	74.75	80.00	156.50	194.50	238.75	294.00	13.50	28.00	18.20	14.50	.....
Denver	78.50	88.00	141.50	166.50	196.00	225.00	11.50–15.50	21.00–30.00	23.27	16.22	.....
Detroit	63.60	67.80	127.10	230.00	270.00	330.00	11.50	12.50	16.50	14.00	21.06
Kansas City	72.50	75.50	92.00	164.00	168.00	199.00	14.00	23.00	.55‡c	.52‡c	2.35§
Los Angeles	77.50	94.25	134.00*	188.00	232.50	311.50	11.50	14.00	18.70	.....	19.70
Minneapolis	78.25	84.00	143.00	165.00	173.00	240.00	13.10	21.00	25.50	21.00	21.00
Montreal	.....	100.00	.....	.....	240.00	.....	14.75	21.50	22.00	12.75	.....
New Orleans	61.60	65.70	123.20	158.90	196.70	.....	14.50	.....	16.60	12.95	.....
New York	84.00	90.00	135.00*	193.30†	238.80†	295.60†	13.75	.....	20.80	16.00	20.80
Philadelphia	80.50	85.90	161.00	182.50	235.00	272.00	15.00	18.00	16.35	11.25	10.75
Pittsburgh	72.65c	77.45c	145.00c	165.00c	217.00c	250.00c	17.50	22.00	16.69	14.10	16.66
St. Louis	62.00	65.00	120.00	165.00	187.00	214.00	15.00	18.00	.48‡	.38‡	2.80p
San Francisco	84.00	94.50	225.00	.....	.....	.....	15.00	18.00	22.50	21.50	2.05p
Seattle	84.00	95.00	180.00	.....	.....	.....	15.50d	15.50	30.00	25.00	3.00p

*6x12x12 in. †F.o.b. Perth Amboy, N. J. ‡Per sack. §Per bbl., 200 lbs. pPer bbl. 180 lbs. gper bbl. 280-lb. kLCL. cLess 5% cash 15 days. dless $1 cash 15 days. *lump.

ROAD SURFACING MATERIALS—F.O.B. CITY

	PAVING BRICK AND BLOCKS			PAVING ASPHALT — Per ton, less than 80 penetration,		ASPHALT BINDERS — FLUXES — Per gal., 80-300 penetration,		CUTBACK ASPHALT — Per ton,		ROAD OILS — Per gal.,		ASPHALT EMULSION — Per gal.,	
	Granite per M, lots of 50,000, 4x4x8 in.,	Brick per M, 3x8½x4 in., carload lots	*Wood per sq. yd., 3½ in., 16-lb. treat,	Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Drum
Atlanta	$ 80.00	$35.00	$2.25	$17.402	$22.472	$0.06942	$0.9612	$19.652	$25.572	$0.06942	$0.105	$0.105
Baltimore	125.00	44.00	2.25	17.00	22.00	.07	.095	.085†	.12†	.....	.....	.....
Birmingham	125.00	24.00	....	18.00	23.00	0.778	.1028	.082†	.112†	.....	.06	.....
Boston	88.00	33.00	2.50	16.00	21.00	.075	.10	.095†	.13†	.075	.09	.125
Chicago	138.00	42.00	....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cincinnati	100.00	37.00	....	18.00	22.00	.09	....	18.50	....	.07	.08	.....
Cleveland	100.00‡	32.75	2.95	20.00	24.50	.075	.09	.075†	.049†	.06	.085	.10
Dallas	.....	30.50	....	15.40	21.10	.0585	.1097	16.40	22.60	.0528	.1076	.1438
Detroit	.....	37.00	....	19.67k	24.87k	.....	.....	17.00	22.50	.....	.....	.....
Kansas City	.....	26.00	2.75	13.70	18.70	13.55#	18.55#	.0603†	.0853†	.03	.11	.16
Los Angeles	.....	48.50	....	10.34	14.50	10.34#	14.50#	10.34	.....	.042	.06	.12
Minneapolis	.....	.....	2.50	18.10	24.60	.098	.098	21.75	34.55	.048	.....	.....
Montreal	.....	110.00	....	14.00	19.66	.07	.093	19.00	26.50	.07	.125	.155
New Orleans	100.00	35.00	....	14.50	18.50	.065	.09	.07†	.10†	.....	.....	.....
New York	137.50§	50.00	2.64	17.00	22.00	.07	.095	.085†	.12†	.....	.085	.12
Philadelphia	120.00	45.00	2.25	15.00	20.00	.06	.....	.07†	.10†	.06	.....	.....
Pittsburgh	115.00	40.00	....	19.00	24.00	.0775	.1125	.086†	.121†	.0675	.....	.....
St. Louis	105.00	35.00	2.00	19.50	24.50	.078	.108	.088†	.118†	.04	.09	.1255
San Francisco	.....	50.00	....	12.00	18.00	12.00#	18.00#	12.50#	23.00#	.04	.0575	.117
Seattle	.....	47.50	....	18.00	23.85	18.00#	23.10#	15.00	.....	.03	.1929#	34.20#

Note: Paving asphalt, tank car or boat, f.o.b. Maurer, N. J., per ton, Bermudez, $25.00; Trinidad, $21.00. *Per sq. yd. †Per gallon. ‡4½x6x5½ in. #Per ton. §4x5x9-in. Av. kMexican. zlocal reduction due to 20% reduction intra-state class freight rates only, Georgia affected.

CURRENT PRICES OF CONSTRUCTION MATERIALS

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS	RIVETS	WIRE NAILS	SHEET PILING	STEEL RAILS (Per Gross Ton)			TRACK SUPPLIES			
	Per 100 lb., base price	¼-in. billet, base price	½-in. structural	Base	Base	Standard	Light	Re-rolled	Angle bars	Std. spikes	Tie plates	Track bolts
Birmingham	$1.95	$2.10	.....	.....	.....	$36.375			$2.55	$2.40	$1.90	$3.55
Chicago	1.85	2.10	$3.00	.....	$2.25	36.375	$35.00	$34.00	2.55	2.40	1.90	3.55
Pittsburgh	1.80	2.05	2.90	$2.60	2.15	36.375	35.00	34.00	2.55	2.40	1.90	3.55

IRON AND STEEL PRODUCTS—BASE MILL PRICES, PER 100 LB., CARLOAD LOTS

F.O.B. WAREHOUSE	STRUCTURAL SHAPES Per 100 lb., base price	REINFORCING BARS Per 100 lb., ¾ in., base price		EXPANDED METAL LATH —Per 100 sq.yd., carload lots—		WELDED FABRIC REINFORCING —Per 100 s.f., carload lots—		6x6 in., No. 6 & 6 wires Per sq.yd	SHEET PILING Per 100 lb base price
		New billet	Rail steel	Std. diamond mesh, 3.4 lb	Std. ribbed 3.4 lb	4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires		
Atlanta	$3.63	$2.48	$2.33	$21.00	$24.00	$1.60	$1.21	$0.151	$2.65
Baltimore	2.90	2.75	2.55	20.00	25.00	1.46	1.12	.137	2.70
Boston	3.52	3.03	2.2125	20.00	24.00	1.50	1.14	.142	2.30
Chicago	3.20	2.10	1.95	22.00	26.00	1.46	1.12	.137	2.25
Cincinnati	3.40	3.25	3.25	25.01	29.50	1.44	1.11	.133	.....
Cleveland	3.16	2.60	2.45	20.00	23.00	1.44	1.11	.133	.....
Dallas	4.00	3.28	3.13	24.50	26.50	1.70	1.27	.161	2.985
Denver	3.92	3.66	.....	24.50	30.50	1.70	1.27	.161	.....
Detroit	3.40	2.885	2.885	24.75†	30.00†	1.48	1.13	.139	2.25
Kansas City	2.78	2.85	2.65	20.50	22.50	1.54	1.17	.145	2.65
Los Angeles	3.10	2.95	.....	23.00	27.50	1.90	1.40	.18	2.50
Minneapolis	3.45	2.82	2.67	22.00	26.00	1.58	1.20	.149	2.55§
Montreal	3.50	3.00	2.75	.....	.....	.....	.....	.....	3.20
New Orleans	.....	.....	.....	19.15	23.00	1.58	1.20	.149	.....
New York	3.37	2.82	2.67	20.00	22.00	1.48	1.13	.139	2.48
Philadelphia	2.005	2.34	2.19	20.00	23.50	1.44	1.11	.135	2.44
Pittsburgh	1.80‡	2.05‡	1.90‡	20.75‡	23.00‡	1.44	1.11	.135	2.15
St. Louis	3.44	2.94	2.79	20.00	22.00	1.46	1.12	.137	2.25
San Francisco	3.55	2.475	2.35	23.00	28.00	1.90	1.40	.18	2.60
Seattle	3.55	3.50	.....	.....	.....	1.90	1.40	.18	.....

‡Base Mill Price. Note: Shapes, bars and piling subject to quantity discounts. §Mill Price plus freight to Minneapolis. †f.o.b. delivered.

PAINTING AND ROOFING SUPPLIES—F.O.B.

	WHITE LEAD Per 100 lb. keg in oil	READY-MIXED PAINT Per gal., drums			ROOFING SUPPLIES Carload lots, f.o.b. factory				
		Graphite*	Aluminum†	Ferric Oxide‡	Rolls, slate surfaced, 85-90 lb., per sq	Asphalt felt, per 100 lb	Tar felt, per 100 lb	Asphalt coating, per gal	Tar pitch, 350-lb. bbl., per ton
Atlanta	$11.50	$1.60	$3.10	.....	$1.99	$1.97	$2.90	$ .36	$25.40
Baltimore	11.00	1.40	2.25	$1.90	2.52	2.48	2.48	.455	23.00
Birmingham	11.50	2.35	2.35	1.85	1.95	1.79	.....	.36	23.00
Boston	10.00	1.75	2.60	.04½x	2.05	3.15	3.15	.45	20.00
Chicago	11.00	1.85	2.45	1.30	1.60	1.59	1.59	.24	20.00
Cincinnati	11.00	1.40	3.00	1.55	2.40	2.39	2.39	.36	21.00
Cleveland	11.00	1.65	2.35	1.30	1.60	2.45*	2.45*	.24	22.00
Dallas	12.00	1.80	2.24	.....	3.15	2.56½	2.56½	.43	30.25»
Denver	11.75	2.55	.....	.....	2.17	3.00	3.00	.50	30.00
Detroit	9.90	1.35	2.20	1.30	1.75	2.35	2.50	.37	27.00
Kansas City	11.12½	1.85	2.25	1.65	1.75	1.85	2.15	.33	26.75
Los Angeles	10.00	1.60	2.25	2.30	2.00	1.50	.....	.45	.....
Minneapolis	11.12½	.....	.....	.....	1.60	1.79*	1.79*	.29	25.10
Montreal	9.40	1.70	3.45	1.65	2.00	2.62	2.02	1.40§	1.52§
New York	11.00	1.70	2.35	1.48	1.60	1.79*	1.79*	.232	22.00
Philadelphia	9.90	1.50	2.05	1.50	1.68	1.85*	1.85*	.34	22.00
Pittsburgh	11.00	1.05	1.95	.80	1.75	1.65*	1.65	.38	22.00
St. Louis	11.00	1.85	2.45	1.30	1.60	2.75	2.75	.24	20.00
San Francisco	10.75	1.80	2.75	1.10–2.00	1.89	3.10	3.10	.38	26.00
Seattle	10.75	.....	1.92	.....	3.10	4.50	.....	.50	27.60

*U. S. War Dept. Spec. 3-49A. †ASTM Spec. D266-31. ‡80% maximum ferric oxide. §Per 100 lb. ¹Per roll, 65 lb. x Per lb. »500-lb. drums.
Note: Red lead dry, same as white lead in oil, red lead in oil 50c higher.

MISCELLANEOUS ITEMS

	WINDOW GLASS Discounts from latest jobbers list, Sept. 15, 1928 Single or Double Thickness		EXPLOSIVES Per lb. dynamite delivered 50-lb. cases Gelatin	
	A quality	B quality	40%	60%
Atlanta	85%	85%	$0.215	$0.2375
Baltimore	90%	92%	.15	.165
Birmingham	88%	90%	.105	.120
Boston	88–10–5%	90–10–5%	.17	.165
Chicago	90%	92%	.....	.....
Cincinnati	87@10%	89@10%	.27	.29
Cleveland	89-10 10%	91-10 10%	.19	.205
Dallas	88%	90%	.155	.175
Denver	86%	88%	.1525	.1675
Detroit	87@10%	89@10%	.237	.255
Kansas City	89@10%	89@10%	.14	.18
Los Angeles	90%*	90@40%*	.1725†	.1925†
Minneapolis	87%	89%	.17	.185
Montreal	.....	.....	.1925	.2175
New Orleans	88%	90%	.19	.22
New York	89%	91%	.22	.235
Philadelphia	88@30%	90@30%	.....	.....
Pittsburgh	90%	90%	.105	.12
St. Louis	90%	92%	.13	.145
San Francisco	90%	90@30%	.1575	.1775
Seattle	90@10%	90@20%	.1425	.1575

*Disc. from list Aug. 1, 1929. †F.o.b. Arsenal.

CHEMICALS

Water, sewage treatment, road work, f.o.b., carlots, New York:	
Bleaching powder, in drums, f.o.b. works, per 100 lb.	$1.90
Calcium chloride, 77-80%, flaked, in 400-lb. drums or 100-lb. moisture proof bags, f.o.b. works, freight equalized with points of competition, per ton	19.50
Chlorine, cylinders, per lb. delivered	.05½
Silicate of soda 52 deg., in drums, f.o.b. works, per 100 lb.	1.35
Soda ash, 58%, in paper bags, per 100 lb	1.20
Sulphate of aluminum, commercial, in 100 lb. bags per ton	27.00
Sulphate of copper, in bbl., per 100 lb	3.85

PILES

Prices per linear foot, pine, with bark on f.o.b., New York; delivered from barge, 1½ to 2c. per ft. additional:

Dimensions	Points	Length	Short Leaf — Barge	Short Leaf — Rail	Long Leaf — Barge	Long Leaf — Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.11	$0.155	$0.12	$0.15½
12 in.—2 ft. from butt	6 in.	50 to 59 ft.	.15	.20	.14	.19
12 in.—2 ft. from butt	6 in.	60 to 69 ft.	.16	.215	.15	.20½
14 in.—2 ft. from butt	6 in.	50 to 69 ft.	.185	.225	.19½	.23½
14 in.—2 ft. from butt	6 in.	70 to 79 ft.	.2025	.225	.23½	.29½
14 in.—2 ft. from butt	5 in.	80 to 85 ft.	.265	.375	.....	.....
14 in.—2 ft. from butt	5 in.	85 to 89 ft.	.305	.442	.....	.....

RAILWAY TIES

Prices f.o.b., per tie, for carload lots:

		6 In. x 8 In. by 8 Ft.	7 In. x 9 In. by 8½ Ft.
Boston	Oak, untreated	$0.90	$1.25
	Pine, untreated	.90	1.25
	Pine, creosoted	1.35	1.90
New York	Long-leaf sap pine, untreated	.80	1.00
	Mixed oak, untreated	.....	1.00
	White oak, untreated	.75	1.50
Birmingham	White oak, creosoted	no market	
	Southern pine, untreated *6x8x8'6"	.45*	.60
	Southern pine, creosoted	1.05*	1.20
Chicago	White oak, untreated	1.15	1.40
	Oak, empty cell, creosoted	1.50	1.88
	Oak, zinc treated	1.40	1.70
	Southern pine, creosoted	1.35	1.78
Los Angeles	Fir, untreated	.70	.72
	Fir, creosoted	1.67	2.40
Philadelphia	Red oak, untreated	1.15	1.35
	Red oak, creosoted	1.40	1.65
	White oak, untreated	1.00	1.45
St. Louis	Red oak, untreated	.98	1.40
	Red oak, creosoted	1.35	1.90
	Sap Pine or cypress, untreated	.78	1.25
San Francisco	Douglas fir, green, untreated	.45	.63
	Douglas fir, empty cell, creosoted	1.14	1.56
Montreal	Birch or maple, untreated	1.10	1.10
	Birch or maple, creosoted	1.25	1.55

CURRENT PRICES OF CONSTRUCTION MATERIALS

WATER, SEWER AND DRAIN PIPE

	C. I. PIPE	VITRIFIED SEWER PIPE				CLAY DRAIN TILE		CONCRETE SEWER PIPE		WROUGHT STEEL PIPE			
	Per net ton, f.o.b. 6 in. and over*	Per foot, delivered, standard (‡ f.o.b.) 8 in., s.s.	12 in., s.s.	24 in., d.s.	36 in., d.s.	Per 1,000 ft., carload lots, f.o.b. 6 in.	8 in.	Per ft., delivered; ASTM C 14-24 12 in.	24 in.	Full standard weight. # 1 to 3 in., Butt Weld Black	Galv.	3½ to 6 in., Lap Weld Black	Galv.
Atlanta	$42.00	$0.225	$0.405	$1.4625	$3.25	$80.00	$128.00	$0.55	$1.60	44%	37%	42%	34
Baltimore	45.50	.24	.46	2.05	6.12	102.00	157.00	.75	2.00				
Birmingham	38.00	.25	.45	1.625	4.660	85.00		.45	1.60	48.939%	37.918%	50.162%†	39.143
Boston	45.50	.231	.4455	2.025	5.945	60.10	101.00	.54	2.00				
Chicago	46.50	.28	.54	1.98	5.60	85.00	120.00	.675	2.25	56%	45%	55%	57
Cincinnati	45.00	.294	.432	1.89	5.74	64.29		.40	1.40	53.04%	42.02%	54.265%	43.24
Cleveland	46.50	.203	.3915	1.665	5.125	47.25	72.00	.536	2.102	58.4%	48.4%	60.6%	49.6%
Dallas	50.00	.27	.486	1.944		120.00	150.00	.46	1.52	64%	55%	65%	56
Denver	58.00	.23‡	.415‡	1.73‡						56%	45%	43%*	57
Detroit	46.50	.28	.54	2.25	6.15	73.25	122.65	.36	1.575	54%	42.3%	54.6%	42.8%
Kansas City	48.00	.32	.57	2.27	4.90								
Los Angeles	46.50	.2825‡	.508‡	2.03‡	5.535‡	115.50	192.50	1.00	2.00	53.57%	43%	53%	42.51%
Minneapolis	48.50	.283	.51	2.04	5.13			.50	1.33				
Montreal			1.10	3.70									
New Orleans	44.00	.275	.462	1.62		50.00		.51	1.69				
New York	45.00	.308	.594	2.64	7.38			.55	2.00	51.88%*	40.86%*	53.10%†*	42.08%
Philadelphia	42.00	.315	.6075	2.70		150.00	230.00			52.37%*	41.35%*	53.39%†*	42.57%
Pittsburgh	48.00	.217‡	.418‡	1.80‡	5.43‡	46.00	82.00	.75	1.75	64%	55%	65%†	56%†
St. Louis	45.00	.27	.486	1.944	3.96	85.00	172.00	.80	2.28	51.51%	40.49%	52.74%	41.71%
San Francisco	46.00	.265	.477	1.908	5.22	105.00	175.00		2.20	52.4%	63.4%	51.1%	64.6%
Seattle	47.50	.35	.63	2.52		85.00	200.00	1.50	1.60	60.3%	51.3%	65.3%	52.3%

*b. & s. class B and heavier, C/L lots. Burlington, N. J. (base) $42.00. Gas pipe and class A, $3 per ton additional, 4-in., $3 per ton additional.

#Discounts from standard list for delivery from warehouse, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.: ¼ in., 8½c; ⅜ in. 11½c.; 1 in. 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92.
†3½ to 6 in., ▲2½ to 3 in. *Resale price to consumer, car load lots shipped from mill.

LUMBER AND TIMBER

		SHORT LEAF YELLOW PINE AND DOUGLAS FIR — Per M ft. b.m., carload lots f.o.b. All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. All Fir planks No. 2 common; Fir timber is No. 1 common. Lengths up to 20 ft.								LONG LEAF Y. P. Per M ft. b.m., C/L lots, f.o.b., merchantable grade up to 20 ft.	
		1x6, S4S	1x8, S4S	2x4, S4S	2x6, S4S	2x8, S4S	2x10 S4S	3x12 Rgh	6x12 Rgh.	12x12, Rgh.	2x12, Rgh.	12x12, Rgh.
Atlanta	Southern Pine	$18.00	$19.00	$21.00	$18.50	$20.00	$20.50	$28.00			$38.50	$40.00
Baltimore	Southern Pine	25.00	26.00	31.50	29.50	30.50	33.00	38.00			54.00	55.00
	Douglas Fir	29.00	29.00	31.00	29.00	30.00	32.50	30.00	$30.00	$30.00		
Birmingham	Long Leaf	18.25	19.25	21.25	19.25	20.25	20.25	42.00			32.00	39.80
	Southern Pine	18.25	19.25	20.00	18.00	19.00	19.00	29.00	29.00	28.00		
Boston	Southern Pine	32.50	34.00	39.00†	40.25†	57.00‡	65.00‡	75.00‡			75.00	75.00
	Douglas Fir	31.25	33.50	39.75	40.25	40.75	41.00	44.00	44.00	44.00		
Chicago	Southern Pine	27.00	28.40	33.50	30.00	31.00	32.50	45.00			54.00	58.00
	Douglas Fir	28.50	29.50	31.75	30.50	30.50	28.50	40.75	41.75	41.75		
Cincinnati	Southern Pine	26.00	27.00	27.50	25.50	26.50	27.50	43.50			43.50	
	Douglas Fir							46.25	46.25	46.25		
Cleveland	Southern Pine	28.50	29.50	31.00	28.00	30.25	30.50	45.00	45.00		46.00	57.00§
Dallas	Southern Pine	26.25	27.00	29.02	26.27	27.92	28.72	42.44			47.55	55.55
	Douglas Fir	29.45	30.53	33.28	30.55	38.64	32.45	44.85	44.85	44.85		
Denver	Douglas Fir		34.50=	38.50*	37.50*	37.50*	42.50*	48.00=	50.00*	55.50		
Detroit	Southern Pine	26.00	27.50	30.00	27.00	30.00	32.00	37.00			32.00	43.75
	Douglas Fir							43.25	44.25	44.25		
Los Angeles	Douglas Fir	27.00	28.50	28.50	25.00	25.50	25.50	35.00	38.00	34.00		
Minneapolis	Western Pine	44.00*	41.25*	34.00*	31.50*	33.00*	31.50*	50.75*‡				
	Douglas Fir	33.25*	34.50*	36.00*	33.50*	35.00*	37.00*	47.00*	50.75*	50.75*		
Montreal	Spruce	30.00	31.00	27.00	29.00	30.00	35.00	38.00				
	Douglas Fir	42.50	42.50	42.50	44.00	44.00	45.75	51.00	51.00	51.00	42.00	
New Orleans	Southern Pine	27.50	28.45	33.20	28.15	30.75	31.95	43.95			45.65	52.75
	Douglas Fir	28.95	31.50	33.90	28.75	32.65	33.95	37.95				
New York	Southern Pine	32.00*	33.50*	37.50*	32.50*	35.00*	36.50*	51.00*			77.50*	77.50*
	Douglas Fir			40.00*	37.50*	38.50*	40.00*	38.25*	40.25*	40.25*		
Philadelphia	Southern Pine	24.50	25.50	27.00	25.50	26.50	27.00	31.00			61.00	59.00
	Douglas Fir			31.00	31.00	31.00	31.00	32.50	32.50	33.50		
Pittsburgh	Southern Pine	26.50	27.75	32.75	29.25	31.75	32.75	41.50			57.50	57.50
	Douglas Fir	33.50	34.50	34.50	33.50	34.00	34.25	46.25	46.25	46.25		
St. Louis	Southern Pine	32.25*	33.75*	35.25*	32.25*	33.75*	33.75*	55.25*			49.00*	71.00*
	Douglas Fir							54.25*	54.25*	54.25*		
San Francisco	Douglas Fir	15.00t	16.00t	17.00t	14.50t	15.50t	16.50t	21.00t	21.00t	21.00t		
Seattle	Douglas Fir	22.50	21.50	21.50	21.00	22.50	22.50	20.00	20.00	22.00		

*Delivered. †Spruce. ‡Long-leafed Y. P. §Norway Pine. ▲Northern Pine. ℓ Douglas fir. =Native. tAt ship's tackle.

CURRENT BUILDING AND CONSTRUCTION WAGE RATES PER HOUR

	Bricklayers	Carpenters	Structural Iron Workers	Hoisting Engineers	Plasterers	Common Labor Building	Common Labor Heavy Const.
Atlanta	$0.70/1.125	$0.40/.90	$0.60/1.25	$0.60/1.25	$0.60/1.00	$0.30/.40	$0.30/.40
Baltimore	1.25	1.10	1.37½	1.25	1.25	.45	.45
Birmingham	1.00	1.00	1.00	1.00	1.00	.30	.30
Boston	1.20	.70/1.17½	1.20	.90/1.37½	.90/1.37½	.40/.70	.40/.70
Cincinnati	1.27½	1.02½	1.20	1.07½	1.27½	.45	.40
Chicago	1.50	1.31¼	1.35	1.31¼	1.50	.82½	.82½
Cleveland	1.25	1.12½	1.25	1.12½	1.25	.72	.72
Dallas	1.00	1.00	1.15	.75	1.00	.40	.40
Denver	.60/1.12½	.60/.87½	.60/.87½	.60/.87½		.50	.50
Detroit	1.25	1.00	1.25	.75/.95	1.25	.50	.50/.70
Kansas City	1.32½	1.12½	1.25	1.12½	1.12	.50/.60	.60/.75
Los Angeles	1.10	1.10	1.25	1.10	1.25	.50	.60
Minneapolis	.90/1.20	.75	.90	.75	.90	.40	.50
New Orleans	1.00	.75	1.00	1.00	1.25	.30/.40	.30/.40
New York	1.50	1.40	1.45/1.65	1.50/1.56¼	1.50	.82½	.82½/.93¾
Philadelphia	.75/1.20	60/1.20	1.00/1.20	.75/1.20	.60/1.20	.30/50	.30/.50
Pittsburgh	.50/1.00	.50/1.00	.50/1.00	.50/1.00	.50/1.00	.35/.50	.35/.50
St. Louis	1.50	1.25	1.47	1.35/1.47	1.50	.78¾	.35/.78¾
San Francisco	1.50*	1.10	1.37½	1.12½	1.25*	.62½	.60
Seattle	1.25	1.12½	1.37½	1.25	1.50	.70	.70
Montreal	0.70	.60	.60	.55	.67	.35	.25

Skilled Avg: (Bricklayers, Carpenters, Ironworkers) $1.12. Common Avg. $0.5388 *6-hr. Day

CONSTRUCTION REPORTS

WATERWORKS

PROPOSED WORK

†Ariz., Coolidge—U. S. Indian Service, Coolidge, soon takes bids drilling 30 wells, and equipping with pumps of 1900, 2200, 2500, 3000, 3500, 4000, 4500 and 5000 g.p.m. with heads from 50 to 120 ft. in steps of 10 ft., motors and pumphouses on San Carlos project.

Colorado—Bd. Water Comrs., Denver, recalled bids that were to have been opened Oct. 15, enlarging, lining part of Moffat Water Tunnel, intake shaft and wye, in Gilpin and Grand Counties. Negotiations have been reopened for Federal Aid. D. D. Gross, City and County Bldg., Denver, engr. Noted Oct. 4.

Colo., Pueblo—Trustees Pueblo Water Works, c/o D. Porter, supt., 319 West 4th St., soon takes new bids 3 complete pumping units of vertical centrifugal type, direct connected to suitable electric or gasoline motor equipment. Former bids rejected. Noted Oct. 2 Daily.

Ill., Louisville—City plans waterworks, incl. 1 story, brick, limestone building. $60,000. Bonds voted and P.W.A. funds allotted. Allen & Vogtborg, 205 West Wacker Dr., Chicago, engrs. Noted Aug. 31, 1933.

Ind., Kokomo—City making plans waterworks. $22,154. F. P. Stradling, Kokomo, supt.

Ky., Brandenburg—City plans complete waterworks system. $44,000. Pending P.W.A. project. Municipal Eng. Co., 518 Citizens Bldg., Louisville, engrs.

Ky., Hogdenville—City plans complete filtration and softener plant, also construction 100 ft. concrete dam 6 ft. high, across Nolynn Creek. $36,000. H. B. Cassin, 518 Citizens Bldg., Louisville, engr.

Ky., Jeffersontown—City plans complete waterworks system without filtration plant, deep wells to be dug. $53,000. Pending P.W.A. project. Municipal Eng. Co., 518 Citizens Bldg., Louisville, engrs.

Ky., Poplar Heights—City plans waterworks distribution system. $31,500. H. B. Cassin, 518 Citizens Bldg., Louisville, engr.

Ky., West Point—City plans complete waterworks system. $45,000. H. B. Cassin, 518 Citizens Bldg., Louisville, engr.

Ky., Wingo—Election Nov. 6, $5,000, to help finance waterworks system, incl. deep well and pump, tank on tower, chlorinators and distribution system, incl. mains, fire hydrants, valves and boxes, etc. P.W.A. allotted $36,000 loan and grant.

Mass., Amesbury—Town, A. E. Webster, chn. Bd. Selectmen, Town Hall, plans reservoir on Powwow Hill.

Mass., Durham—Town, Bd. Selectmen, Town Hall, plans nearly completely for construction of filtration plant and dam at Oyster River. Weston & Sampson, 14 Beacon St., Boston, engrs.

Mass., Wareham—Wareham Fire Dist., H. C. Newman, chn. Water Comn., Town Hall, plans completed for extension of c.i. pipe watermains and construction of 200,000 gal. steel standpipe. $100,000. Whitman & Howard, 89 Broad St., Boston, engrs.

Miss., Laurel—City revoked P.W.A. loan and grant of $129,000 for waterworks improvements. Noted July 19.

Mo., Wentzville—City bids in November, improving waterworks, incl. tanks on tower, pumps 2- to 8-in. c.i. mains, fire hydrants, valves and boxes. $45,000. P.W.A. project. Noted Oct. 4.

N. Y., Cornwall—Municipality bids late in December, general contract watermains. H. Taylor, 9 Park Pl., New York, engr. P.W.A. project. To exceed $20,000.

N. Y., Munnsville—Village plans improving springs, laying 36,300 lin.ft. 4- to 8-in. c.i. pipe, 200,000 gal. storage tank. $52,000. H. P. Starbird, 317 1st Trust & Deposit Bldg., Syracuse, engr. Noted Oct. 25.

O., Gnadenhutten—Village making plans waterworks. P.W.A. granted $49,000 loan. Arnold, Rosch & Hartlein, New Philadelphia, engrs. Noted Mar. 29.

Okla., Shawnee—City final plans in preparation, may take bids at an early date impounding reservoir, for waterworks. $750,000. P.W.A. project. T. E. Thompson, city mgr. Noted July 12.

Pa., Butler—Butler Country Club plans purchasing new pump, equipment and reservoir tanks to replace equipment destroyed by fire. $1,000. R. Strain, c/o owners, engr.

S. C., Batesburg—City making plans extending water lines, adding filtering plant, raw waterline from stream to filtering plant. $95,000. Ryan Eng. Co., Arcade Bldg., Columbia, engrs. P.W.A. loan approved.

Tenn., Algood—City plans waterworks system. Application made to P.W.A. for $35,000 loan and grant. J. A. Switzer, Engineering Bldg., Knoxville, engr.

Tenn., Grand Junction—City plans waterworks. Application made to P.W.A. for $37,000 loan and grant. J. B. McCrary, 22 Marietta St. Bl., Atlanta, Ga., engrs.

Tenn., Jackson—City, W. P. Moss, plans waterworks and sewerage improvements. Application to P.W.A. made for $156,000 loan and grant. H. E. Dike, City Hall, engr. Noted Oct. 25.

Tenn., Jamestown—Town, waterworks. Made application to P.W.A. for $46,000 loan and grant. J. A. Switzer, Engineering Bldg., Knoxville, engr. Noted Sept. 13.

Tenn., Monterey — City, J. R. Reed, mayor, plans waterworks and sewerage. Application made to P.W.A. for $67,000 loan and grant. J. B. McCrary Engr. Co., 22 Marietta St. Bl., Atlanta, Ga., engrs.

Tex., Abernathy—City, J. D. Norman, mayor, soon takes bids waterworks, incl. 50,000 gal. steel elevated tank on 75 ft. steel tower, deep well and cased booster pumps about 150 g.p.m. oil or electrically driven engine, probably 250 hp., 2- to 8-in. watermains, meters, fire plugs, etc. $26,000. P.W.A. loan and grant approved. H. B. Roberts, Lubbock, engr. Noted Aug. 30.

Tex., Crockett—City, c/o H. J. Traube, waterworks and sewer improvements. $76,000. Project abandoned. P.W.A. allotment rescinded. Engineering Service Corp., Shell Bldg., Houston, engrs. Noted July 12.

Tex., Dawson — City, c/o W. R. Johnson, mayor, voted bonds waterworks extension, incl. reservoir, new pumps, supply mains and fire hydrants. $46,000. **P.W.A.** A. F. Mitchell, Corsicana, engr. Noted Sept. 27.

Tex., Lovelady—City, c/o M. C. Click, mayor, plans waterworks. $24,000 P.W.A. allotment approved. Engineering Service Corp., Shell Bldg., Houston, engrs. **Noted Oct. 26.**

Tex., Olney—City, E. Hill, mayor, soon takes bids waterworks system, incl. 16,000 lin.ft. 4- to 8-in. c.i. mains, 200,000 gal. steel tank and 75 ft. steel tower, pumping unit electrically-driven motors of 250 hp., mechanical equipment in separate contract. $133,000 P.W.A. loan and grant allotted. Montgomery & Ward, Harvey-Snider Bldg., Wichita Falls, engrs. Noted Sept. 13.

Tex., Santa Anna—City, W. E. Baxter, mayor, bids after Nov. 25, waterworks, incl. 2 mi. 10 in. main and relaying old lines, c.i. pipe. $35,000. M. M. Moseley & Associates, Coleman, engrs. P.W.A. project. Noted Sept. 13.

Tex., Santa Rosa—City, c/o J. V. Wood, secy., soon takes bids waterworks system, incl. 50,000 gal. steel tank, 100 ft. concrete tower, deep water well with complete casing; one 150 g.p.m. and one 250 g.p.m. pumps, 68 in. c.i. mains, fire hydrants. $26,000. P.W.A. project. H. E. Bennett, Mercedes, engr. Noted Feb. 8.

Ont., Burlington—Town Council plans waterworks addition. $150,000.

Ont., Ingersoll—Town making plans installing deep well water pump. $4,000. H. G. Hall, Ingersoll, engr.

Ont., Toronto—City soon takes bids extending waterworks as part of city relief works program. $87,000.

BIDS ASKED

Ill., Colchester—Nov. 20, by City, E. V. Kinsey, mayor, waterworks. $76,500. P.W.A. project. Kinsey Eng. Co., Pekin, engrs.

Ill., Fairbury—City bids about Nov. 12, improving and extending waterworks plant and distribution system, etc. $55,000. P.W.A. project. L. B. Decker, city clk. Noted July 19.

Ill., Griggsville—Nov. 8, by City, G. R. Anderson, mayor, constructing waterworks system, consisting of porous concrete well, rein.-con. water storage chamber and complete pumping station, 6 and 8 in. c.i. force main, complete water distribution system, pipe, valves, fittings, hydrants, service meters, and 60,000 gal. elevated tank on steel tower and concrete foundations. P.W.A. project. Caldwell Eng. Co., Jacksonville, engrs.

Ind., Valparaiso—City taking bids waterworks, incl. c.i. mains, in and along Lincolnway. $25,000. A. J. Fehrman, Valparaiso, chn.

La., New Orleans—Dec. 27, by Sewerage & Water Bd., installing several miles watermains in Gentilly Rd. here and in Algiers. Contr. 202-W; furnishing c.i. pipe, all sizes, valves, etc., Contr. 201-W. P.W.A. project.

La., New Orleans—Jan 10, by Sewerage & Water Bd., installing 30 in. mains in Magnolia and other streets. Contr. 204-W; furnishing c.i. pipe, gate valves, fittings and appurtenances to be used in Magnolia and other streets, Contr. 204-W.

N. Y., Batavia—Nov. 14, by City, constructing 1¼ m.g. elevated water tank. $96,000 bond-voted. Not P.W.A. project. Alexander Potter, 50 Church St., New York, archt.

Okla., Alva—T. W. Keltch, city clk., bids about Nov. 25, constructing waterworks, extensions and improvements. $28,000. P.W.A. project. Benham Eng. Co., Kansas City, engrs. Noted Jan. 25.

Tex., Anna—Nov. 20, by City, c/o J. Cox, mayor, waterworks improvements, incl. c.i. pipe specials, tees, plugs, fire hydrants, meters, etc. $22,000. P.W.A. project. E. L. Dalton, Dallas Bank & Trust Bldg., Dallas, engr.

Tex., Big Sandy—Nov. 16, by City, c/o J. A. Mings, mayor, waterworks and sewer improvements, incl. deep wells, distribution system, c.i. pipe, valves, meters, sewer extension, sewage disposal plant. $63,000. P.W.A. project. Hawley, Freese & Nichols, Capps Bldg., Fort Worth, engrs. Noted July 26.

Wis., Milwaukee—Nov. 14, by Dpt. P. Wks., City Hall, constructing filtered water reservoir and coagulation basins for water purification plant. P.W.A. project. R. E. Stoelting, comr.

Tex., Dawson—City, W. P. Johnson, mayor, bids about Dec. 1, waterworks extension, incl. new rein.-con. reservoir, 2 new pumps, 12,000 ft. 8- to 12-in. c.i. main pipe, fire hydrants, 40,000 cu.yd. earth excav., etc. $54,000. Bonds voted for same.

Tex., Del Rio—Nov. 9, by City, c/o J. G. Long, mayor, complete new waterworks system, wells, elevated tank and pipe lines, involving 63,332 ft. 2- to 8-in. c.i. pipe, 13.2 cu.yd. concrete, 60 cu.yd. common and wet excav., 51 cu.yd. rock excav., 21 fire hydrants without valves, five hundred ¾ x 1 in. meters, 600 concrete meter boxes, etc. $77,000. P.W.A. project. P. Blevens, Del Rio, city engr.

Tex., Hughes Springs—Nov. 15, by City, c/o G. E. Goolsby, mayor, waterworks and sewers, incl. c.i. pipe, fittings, valves, pump house, vitr. clay pipe and disposal plant. $82,000. Municipal Eng. Co., Burt Bldg., Dallas, engrs. P.W.A. project. Noted July 26.

Tex., Stamford—Nov. 12, by City, c/o E. P. Bunkley, mayor, waterworks improvements, incl. Group 1, 12 in. and 16 in. c.i. pipe lines and connections; Group 2, flood water storage reservoir and salt water lagoon; Group 3, intake and outlet structure, intake weir and pipe, connections, treating and softening plant, mechanical equipment and pipe installation in treating plant, treating plant buildings, roads, walks, retaining wall and fence; Group 4, salt water well; Group 5, 2 steel storage tanks; Group 6, pumps and pumping equipment. $154,000. Work will be let in 1 or more contracts. Bidders may bid on all, any one or combination of groups described, but owner reserves right to let any one or all of groups 4, 5 and 6 as separate contracts. W. J. Powell, Republic Bank Bldg., Dallas, engrs. Noted May 24.

Tex., Three Rivers—Nov. 12, by City, H. Coquat, mayor, waterworks improvement, 100,000 gal. steel elevated tank and 100 ft. steel tower, water softening plant, 12,000 ft. 4- to 6-in. c.i. main extensions, meters. $26,000. P.W.A.

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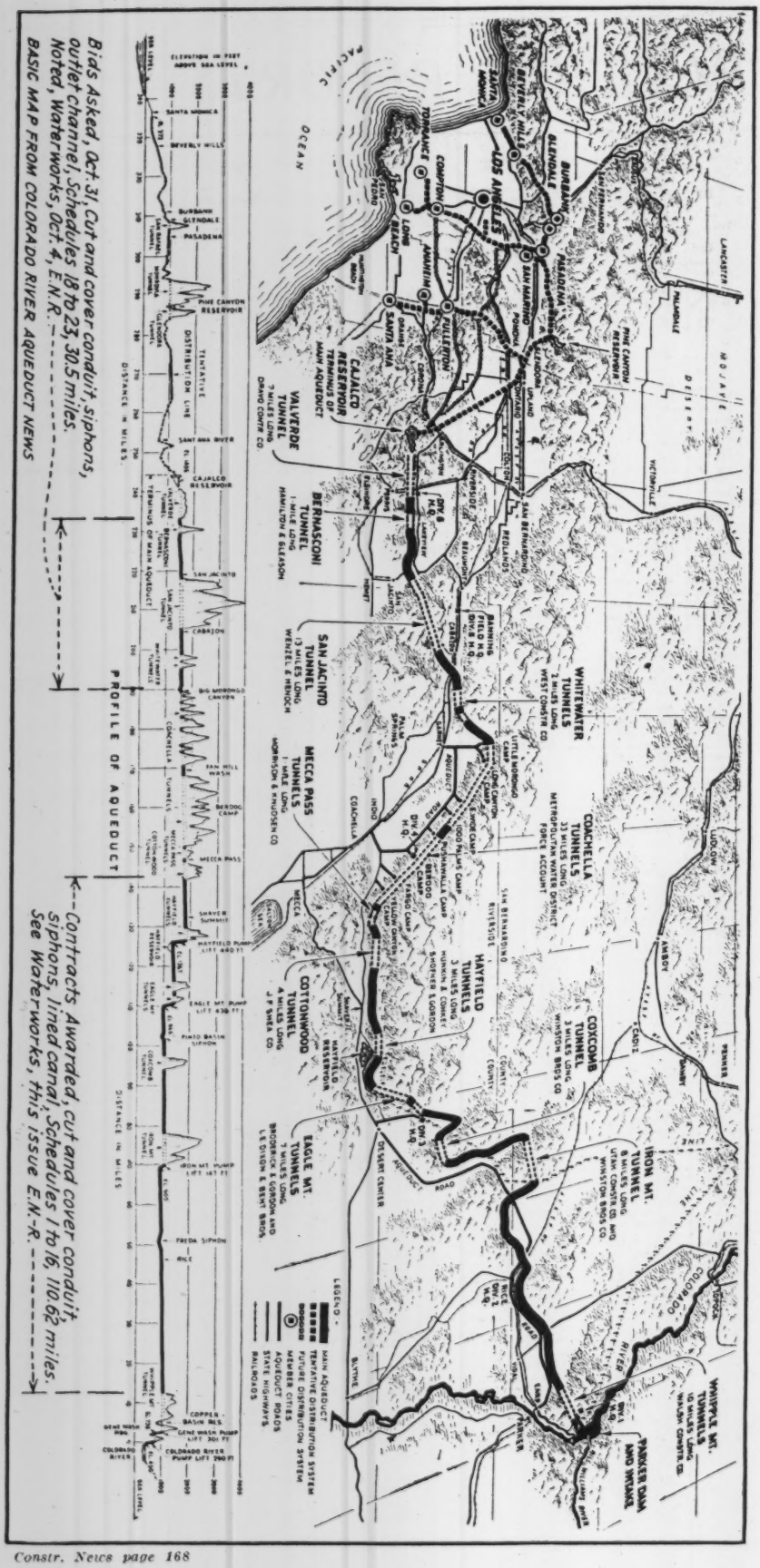

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Waterworks (Continued)

project. A. A. Ririe, 622 East Woodlawn Ave., San Antonio, engrs. Noted Oct. 18.

Ont., Port Colborne—Nov. 5, by M. [illegible] town clk., 270 ft. 22 in. steel pipe for [illegible] pipe line, in lengths of 30 ft. with plain [illegible] to be used with Dresser couplings. [illegible] C. A. Grassie, town engr.

CONTRACTS AWARDED

Ark., Leachville—O. O. Stires, recdr., [illegible] waterworks system, Contr. B, involving [illegible] for well and pump, power and light wiring, distribution system, to V. E. Scheveneil & Co., 1280 Walker St., Memphis, Tenn., $25,1[illegible]*** Contr. A, 1 deep well pump, to Layne-Arkansas Co., Stuttgart, $7,380***Contr. C, tank and tower, to Chicago Bridge & Iron Wks., [illegible] Bldg., Dallas, Tex., $8,890. Grand total $41,440. **P.W.A.** Bids Oct. 18, awarded (tentatively) Oct. 19. Noted Aug. 9.

Calif., Los Angeles—Metropolitan Water Dist., F. E. Weymouth, engr., 306 West 3rd St., construction 110.62 mi. cut and cover concrete lined canal, and monolithic siphons, to Hanrahan Co., Youdall Constr. Co., Elliott, Stroud Bros. & Seabrook, C. Harlowe, Jr., and C. M. Elliott, c/o C. M. Elliott, 1120 Atchison St., Pasadena, Schedule 1 $1,036,774; Schedule 10 $819,505; Schedule 11 $973,227; Schedule 13 $632,037***to Barrett & Hilp, and Morrison Constr. Co., 815 Paramount Ave., Clearwater, Schedule 2 $1,094,992; Schedule 3 $974,754; Schedule 7 $853,461***to Jahn & Bressi Constr. Co., Lane Mortgage Bldg., Schedule 4 $704,318; Schedule 5 $715,057***to C. W. Wood & M. J. Bevanda, Elks Bldg., Stockton, Schedule 6 $[illegible] 884; Schedule 8 $881,717***to Utah Constr. Co., 1 Montgomery St., San Francisco, Schedule 9 $955,249***to Three Companies, Denver, Colo., (V. K. Jones, vice pres. New Mexico Constr. Co., W. S. Broderick and D. G. Gordon by D. G. Gordon, 215 South Bedford St., Beverly Hills), Schedule 12 $1,313,272***to Thompson Starrett Co., 444 Madison Ave., New York, Schedule 14 $926,961; Schedule 15 $1,028,047; Schedule 16 $814,921. Grand total $14,125,176. Bids Oct. 11. Noted Sept. 20.

Calif., San Francisco—F. Taylor, secy. Public Utilities Comn., City Hall, laying 6 and 8 in. c.i. mains in area from Division St. to Esmeralda St. and from Mission to Iowa Sts., involving 25,600 lin.ft. excav. and backfill trench 17 in. wide, 36 in. deep, replacing pavement, etc., to Pacific Pavements Co., 85 Barstow St., $37,689***laying 6 and 8 in. c.i. watermains in area from Ocean Ave. to Alemeny Blvd. and from Junipero Serra Blvd. to Lee Ave., 37,160 lin.ft. excav. and backfill, trench 17 in. wide, 36 in. deep, replacing pavements, to Lowrie Paving Co., 1540 16th St., $41,690***excavation and embankment for University Mound Reservoir, involving 250,000 cu.yd. excav. and disposal of surplus material, 170,000 cu.yd. construct embankment, 2,500 hours provide and operate rolling equipment, 500 cu.yd. structure excav., 75 cu.yd. concrete work, 1,500 lin.ft. 6 in. tile drain, to Granfield-Farrar & Carlin, 67 Hoff St., $97,025. Grand total $176,404. **P.W.A.** Bids Oct. 17, awarded Oct. 23.

Ky., Tompkinsville — City, general contract waterworks system, to Southeastern Constr. Co., Eminence, $44,539; 50,000 gal. elevated steel tank, to Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh, Pa., $5,920. Noted Oct. 4.

Mass., Quincy—City, Water Dpt., City Hall, reinforcing steel and structural steel for construction of 2 booster stations, to Truscon Steel Co., 38 Chauncey St., Boston; pumping equipment, to F. A. Mazzur & Co., Inc., 141 Milk St., Boston. Noted Aug. 16.

Mass., Townsend—Town, Bd. Water Comrs., Town Hall, H. B. Boynston, chn., constructing pumping station, small bridges, grading, brick and concrete construction, to P. J. Keating Co., 107 Kimball St., Fitchburg, $18,669. Bids Oct. 16, awarded Oct. 23. Noted Oct. 11.

Minn., Butterfield—Village, mains, to Jacobs Bros. and Hector Constr. Co., Bird Island, $15,942***tank and tower, to Minneapolis—Moline Power Implement Co., 29th St. and Minnehaha Ave., Minneapolis, $7,055. Bids Oct. 19.

Mo., Adrian—City, improving waterworks, incl. drilled wells, centrifugal pumps, pipe, hydrants, connections, to J. O'Neil, Leavenworth, Kan., $43,037, based on eliminating half of service connections and ¾ in. pipe and using substitute for lead. **P.W.A.** Bids Oct. 28. Noted Oct. 4.

Mo., Wentzville—City, deep well, to F. M. Luth, 4135 Flora Blvd., St. Louis, $2,228. Bids, Oct. 12. Noted Oct. 4.

Neb., Beaver City—City, insulating ice plant at waterworks, to Armstrong Cork & Insulation Co., 805 Farnam Bldg., Omaha, $1,265***ice machine for ice plant, to Baker Ice Machine Co., 3601 North 16th St., Omaha, $5,541***pump to Interstate Machine & Supply Co., 1006 Douglas St., Omaha, $2,169***10 in. tubular well, to R. Anderson, Cedar Vale, Kan., $4,250. Grand total $13,225. Bids Oct. 5. **P.W.A.**

N. J., Ramsey—Boro Council, retaining wall and lining reservoir, to Cement Gum Co., Allentown, Pa., $7,732. **P.W.A.** Bids Aug. 28. Noted Aug. 23.

N. Y., Buffalo—Grade Crossing Comn., G. G. Minnis, watermain changes and sewer diversions in connection with eliminating Williams and

†*Federal Government.*

Waterworks (Continued)

South Ogden Streets grade crossing, to Fahning Constr. Co., Leroy Ave., $24,500. Bids Oct. 3. Noted Sept. 27.

N. C., Carolina Beach—Town Comrs., N. L. Mintz, Wilmington, town clk., constructing distribution system, to R. R. Eagle, New Berne, $27,070***tank and tower, to Chicago Bridge & Iron Wks., Birmingham, Ala.***pump, to Hyman Supply Co., Wilmington. Total est. $50,000. Bids for deep well rejected. **P.W.A.** Bids Oct. 12. Noted Sept. 27.

Okla., Selling—City, waterworks system, incl. well, tank, pumps, main valves and hydrants, to E. W. Baker & Co., 247 Southwest 21st St., Oklahoma City, $26,244. Est. $28,000. **P.W.A.** Noted Dec. 28, 1933.

Pa., Reading—City Clerk, Contr. 66A, Maiden Creek Tunnel, work under this contract pertaining to completion of construction of water tunnel 6 ft. 9 in. interior diam. by 2,800 ft. long, approximately 450 ft. can be constructed by open cut method, the remaining 2,350 ft. must be constructed by tunnel methods, Ontelaunee Twp., Berks Co., to J. Lombardi, Real Estate Trust Bldg., Phila., $235,123. Bids Oct. 17. Noted Oct. 4.

Utah, Layton—City Council, replacing wooden pipe, with c.i. pipe and other improvements to present municipal system, to Waterworks Equipment Co., 149 West 2nd St., Salt Lake City, $16,546; installing materials, to Wheelwright Constr. Co., Ogden, $5,608. Est. $25,000. **P.W.A.** Bids Oct. 15. Noted July 26.

Wis., Milwaukee—Dpt. P. Wks., City Hall, watermains in South Muskegon Ave. and South 16th St., to Kramp Constr. Co., Berlin, $26,611. Bids Oct. 19, awarded Oct. 23.

SEWERAGE AND WASTE DISPOSAL

PROPOSED WORK

Calif., Oxnard—City election Nov. 9, to vote bonds, sewage disposal plant, incl. primary clarifier, digester, pumping station, trickling filter, secondary filter, sludge pump, drying beds, screens, etc., $54,000. Currie Eng. Co., San Bernardino, engrs. Noted Oct. 4.

Ill., Polo—City making plans sewage disposal plant. $36,000. Suhr, Berrymen, Peterson & Suhr, Inc., 130 North Wells St., Chicago, engrs. P.W.A. project.

Md., Chestertown—City plans sewers and sewage disposal plant. $45,000. **Maturity this winter.** P.W.A. funds allotted. Whitman, Requardt & Smith, Charles & Biddle Sts., Baltimore, engrs. Noted July 19.

Md., Federalsburg—City making plans sewers. F. Dryden, Salisbury, engr. **Maturity this fall.**

Mass., Randolph—Town, Town Clerk, Town Hall, appointed committee to make recommendations at town meeting in March 1935, regarding construction of proposed sewerage system through town. To exceed $25,000. Engineer not appointed. Noted Mar. 29.

Minn., Minneapolis — City soon takes bids sewer interceptor from 600 ft. north of Lake St. to Minnehaha Ave. $380,000. E. T. Paul, city engr.

N. Y., Newfane—Town Bd. making plans sewerage system. To exceed $25,000. Industrial Planning Corp., Walbridge Bldg., Buffalo, engrs.

N. Y., Utica—City bids late in December general contract sewerage works. H. Taylor, 9 Park Pl., New York, engrs. P.W.A. project.

N. D., Lisbon—City election Nov. 6, $40,000, for sewage disposal plant. W. R. Sandager, city aud. Noted Sept. 27.

O., Kent—Plans for rehabilitation of Kent Sewage Disposal Plant were presented to City Council. W. I. Harvey, mayor, C. C. Homman, engr.

O., Salem—City plans storm water sewers in several sections of city to eliminate flood conditions in East State, Lincoln and 3rd Sts. $38,000. F.E.R.A. will provide $35,000 while city will allot $4,000. Awaiting action of council for final legislation. F. S. Barckhoff, Salem, engr.

O., Washington C. H.—City made plans interceptor sewers and disposal plant. $150,000. Greeley & Hanson, 6 North Michigan Ave., Chicago, Ill., consult. engrs.

R. I., Pawtucket—City, A. J. Lamarre, comr. P. Wks., City Hall, making plans activated sludge sewage disposal plant. $1,000,000. T. E. Harding, city engr.

Tenn., Jackson—See "Waterworks."

Tenn., Monterey—See "Waterworks."

Tex., Harlandale—Water Impvt. Dist. 4, c/o P. H. Mullinax, San Antonio, plans election to vote bonds 6 mi. 12- to 24-in. sanitary vitr. clay or concrete mains, $154,000. J. W. Beretta Engineers, Natl. Bank Commerce Bldg. engrs. P.W.A. project.

Vt., Manchester — Municipality preliminary study sewers. Est. about $25,000. Engineer not appointed.

N. B., St. John—L. Wilson, comr. P. Wks., preparing plans incinerator, $75,000.

†*Federal Government.*

Ont., London—City Council contemplates program of sewer extensions and drainage improvement. $150,000. W. M. Veitch, city engr., will prepare a report.

Sask., Regina — City making plans sludge lagoons at sewage disposal plant. D. McCannel, city engr.

BIDS ASKED

Ill., Breese—Nov. 8, by City, sewerage system and sewage disposal plant. $96,000. P.W.A. loan and grant available. Kinsey Eng. Co., 20 South Central Ave., St. Louis, Mo., engrs. Noted Apr. 26.

Ill., Edwardsville — Nov. 7, by City, W. Straube, mayor, City Hall, sewers, $198,500. P.W.A. project. Sheppard, Morgan & Schwaab, Edwardsville, engrs.

Ind., Huntington—Nov. 15, by City Council, remodeling Imhoff tanks, installing sludge pumps, constructing dosing tank, trickling filter, and secondary settling tanks. $95,000. C. H. Hurd, 1041 Architects Bldg., Indianapolis, engrs. P.W.A. project. Noted Oct. 12, 1933.

Ky., Murray—Nov. 9, by City Chief Clerk, Contr. 2, sewage disposal plant. P.W.A. project. Noted Sept. 27. Former bids rejected. J. N. Chester Engineers, Clark Bldg., Pittsburgh, Pa., engrs.

La., New Orleans—Dec. 27, by Sewerage & Water Bd., furnishing, installing sewers in Algiers between S.P. R.R. Railroad Yards and Farregut St., Contr. 116-S; in area bounded by Industrial Canal, St. Bernard Parish, St. Claude and Claiborne Aves., Contr. 115-S; furnishing, laying pipe in St. Charles Ave. from Lee Circle to Fleeity St., Contr. 218-D; installing underground power cable from Station D to Station 3, from Station D to Station 5, Contr. 129-D; furnishing 10,000 ft. underground power cable, Contr. 128-D; hauling underground power cable to various jobs, Contr. 132-D. P.W.A. project.

La., New Orleans—Jan. 3, by Sewerage & Water Bd., laying concrete pipe lines in South and North Olympia Sts. between Orleans and Banks St., Murat St. between Palmyra and Bank Sts., Bank St. between Olympia and South Carrollton Ave. and St. Claude St. between Poland and Japnica Sts., Contr. 220-D; concrete lined and covered drainage canal and pipe line in South Claiborne Ave. from Nashville to Leonidas Sts., Contr. 219-D; installing underground cable from Power House 2 to Station 1 and from Power House 2 to Station 6, Contr. 130-D. P.W.A. project.

La., New Orleans—Jan. 10, by Sewerage & Water Bd., drainage pipe line in Jefferson Ave. from Claiborne Ave. to McKenna St., Contr. 223-D; concrete lined and covered canal in Genl. Taylor St. from Broad to Willow Sts., Contr. 222-D; lined and covered drainage canal and pipe lines in Lamarque, Whitney, Nuna and Genl. Meyer Aves. from Station 8 to Saux Lane in Algiers, Contr. 221-D; installing underground cable from Station 3 to Station 7, and from Station 7 to Station 6, Contr. 131-D. P.W.A. project.

Mich., Charlotte—Nov. 5, by L. B. Frace, city clk., sewage treatment plant, incl. sedimentation tank, sludge digester, covered sludge bed, control house and connecting sewers, $41,500. P.W.A. project. Equipment has been purchased by city. Menefee & Dodge, Ann Arbor, engrs. Noted Aug. 23.

Mo., Bolivar—Nov. 5, by City, 52,633 lin.ft. 8- to 12-in. vitr. tile pipe, 112 ft. 8 and 10 in. c.i. pipe, Y branches, 131 manholes, 5 drop manholes, 13 flush tanks, 13 service connections, 1,600 lin.ft. ¾ in. c.i. pipe, 5 cu.yd. miscellaneous concrete, disposal plant, incl. screen chamber, Imhoff tank, sludge beds, rock filters, resettling tank, outfall and miscellaneous piping. $89,000. P.W.A. project. Former bids rejected. E. T. Archer & Co., 609 New England Bldg., Kansas City, engrs. Noted Oct. 4.

N. Y., Olean—See "Contracts Awarded."

Pa., Albion—See "Contracts Awarded."

Tex., Big Sandy—See "Waterworks."

Tex., Dallas—Nov. 14, by City, c/o E. Goforth, secy., constructing St. Louis St. Relief Sewer, incl. clay pipe, manholes, c.i. pipe and concrete pipe tunnel. P.W.A. Project. O. H. Koch, dir. P. Wks.

Tex., Hughes Springs—See "Waterworks."

Wis., Burlington—Nov. 10, by Bd. P. Wks., constructing sewage disposal plant, incl. 1 story, 20x30 ft. glass service building, primary and digester tanks, and sewage pumping equipment. R. Cramer & Sons, Milwaukee, engrs.

CONTRACTS AWARDED

†Calif., San Rafael—Con. Q.M., constructing drainage ditch at Hamilton Field, to Meyer Rosenberg, 255 Bayshore Blvd., San Francisco, $3,263.

Conn., Manchester — Town, sewage sludge beds. Town builds with F.E.R.A. labor. J. F. Bowen, 570 Woodbridge St., engr.

Ind., North Vernon—City, sewage disposal plant, to J. S. Gingrich, 5339 Park St., Indianapolis, $35,124. **P.W.A.** Bids Sept. 14.

Ia., Sioux City—City, reconstructing sewers, part of extensive project, Sect. 3, Project E, to Western Paving Corp., Sioux City, $95,460. Est. $100,000. **P.W.A.** Bids Oct. 12.

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Sewerage, etc. (Continued)

Ky., Murray—City Clerk, Contr. 1, sewerage disposal system, to M. Thomsen, Kenosha, Wis., $64,031. **P.W.A.** Bids Oct. 19. Noted Sept. 27.

Md., Hurlock—Town, Com. R. V. Layton, mayor, 4 mi. 8- to 12-in. terra cotta sewers, manholes and disposal plant, consisting of Imhoff tanks, sludge bed and structures, to George & Lynch, Dover, $52,000. **P.W.A.** Noted Sept. 20.

Mass., Boston—City, Dpt. P. Wks., C. J. Carven, comr., City Hall Annex, concrete sewer lines in Camp Ground Area Outlet, Hyde Park, to N. Cibotti & Co., 46 Water St., Hyde Park, $32,191. Bids Sept. 21; clay sewer line in Hooker St., Brighton, to Frank J. Jacobs Co., 1718 Centre St., West Roxbury, $1,060. Bids Oct. 2. Awarded Oct. 23.

Mass., Natick — Town, Bd. P. Wks., Middlesex Ave., furnishing, delivering clay sewer pipe, Contr. 1, to J. W. Doon & Son, Cochituate St., Natick, $8,528•••c.i. pipe and special castings. Contr. 2, to Florence Pipe & Fdry. Co., c/o R. D. Wood & Co., 400 Chestnut St., Phila., Pa., $17,164•••constructing concrete and vitr. clay force main, sewage treatment works and outlet drain, Contr. 4, to A. D. Daddario, 15 Agnes Ave., Hyde Park, $112,421. **P.W.A.** Grand total $138,113. Bids Oct. 13, awarded Oct. 23.

Mich., Detroit—Dpt. P. Wks., City Hall, pile driving work in connection with sewer outlets and dock faces on Detroit River, incl. Mt. Elliott outlet, Fort St. and Campbell Ave. outlets, to A. J. Dupuis Co., 1812 Ford Bldg., $5,400. Additions to be at following rates: round timber piles per foot of length 20c, steel sheet piling per lin.ft. of wall $6.70, timber sheeting per lin.ft. of wall $4.90, driving and pulling temporary sheeting per lin.ft. of wall $10. **P.W.A.** Awarded Oct. 18. Noted Oct. 5.

N. Y., Olean—City, storm sewers in various parts of city, razing unused pumping stations in Allegheny River, cleaning and diking Two Mile Creek through city, day labor. $76,000. City Eng. Dpt., engrs.

O., Columbus—W. J. Lucks, dir. Serv., constructing outlet conduit, for sewage disposal plant, Contr. 11, involving monolithic concrete rail steel reinforcing, 10,200 cu.yd. excav., 2,700 cu.yd. Class A concrete, 273,000 lb. steel reinforcement, to Bryant & Detwiler, 2304 Penobscot Bldg., Detroit, Mich., $68,325. **P.W.A.** Bids Oct. 2. Noted Sept. 27.

O., Springfield—City Manager, Sect. G of Contr. 12 of Buck Creek Intercepting Sewer, 48 in. rein.-con. sewer pipe, 4,000 ft. 8 in. subdrains, 1,884 ft. 48 and 54 in. rein.-con. pipe, 1,000 lb. reinforcing steel, to Connelly Bros. Co., 1010 Second Natl. Bank Bldg., Cincinnati, $37,652. Est. $40,754. **P.W.A.** Noted Oct. 18.

Okla., Granite—City, 19,600 ft. outfall sewers and sewage disposal plant, to Humphreys Bros., Omaha, Neb., $28,500. Est. $30,000. **P.W.A.** Bids Oct. 8. Noted Oct. 4.

Pa., Albion—Village, constructing sewerage system, day labor. $77,000. Hill & Hill, North East, engrs. R.W.D. project fund allotted. Noted July 5.

Pa., Pittsburgh—R. Neff, archt., 301-A City County Bldg., Northside City Incinerator, to Hiler Eng. Co., 122 Livingston St., Brooklyn, N. Y., and Koppers Constr. Co., Koppers Bldg., joint bid, $485,000•••constructing smaller plant at Brilliant Pumping Station, to De Carie Co., 155 East 44th St., New York, $245,400. R. P. Moyer, health dir. Bids Sept. 6. Noted Aug. 30.

R. I., Providence—City, F. Nolan, engr., constructing aeration tanks, etc., in connection with Field's Point sewage disposal plant additions and alterations, Contr. 3, to Tucker Constr. Co., Inc., 346 Washington St., $336,500. **P.W.A.** Bids Oct. 8, awarded Oct. 26. Bids later for Contr. 4, involving furnishing pumps, motors, etc. Noted Oct. 18.

Tex., San Antonio—Bexar Co. Water Control & Impvt. Dist. 1, c/o J. C. Hall, pres., South Texas Bank Bldg., supplying 32,000 lin.ft. 12 and 24 in. rein.-con. sewer pipe, to Mission Concrete Pipe Co., 1519 Hoefgen St., approximately $76,000. Total est. $145,000. J. W. Beretta Engineers, Inc., Natl. Bank of Commerce Bldg., engrs.

†Va., Langley Field—Con. Q.M., storm sewers and open ditches, to A. G. Pinkston & Co., Box 92, Norfolk, $19,545.

Wis., Cedarburg—City, to R. J. Wilson Constr. Co., Appleton, general contract constructing sewage disposal plant, $17,970•••to American Wells Wks., Aurora, Ill., rotary distributor and equipment for clarifier, $1,800•••to Lakeside Eng. Co., 176 West Adams St., Chicago, Ill., screen, $1,645•••to Bailey Meter Co., 20 North Wacker Dr., Chicago, Ill., flow meter, $343••• to Yeomen Bros., 1433 Dayton St., Chicago, Ill., 250 g.p.m. vertical wet basin pump, $422; 500 g.p.m. vertical dry basin pump, $337; 200 g.p.m. vertical dry basin pump $231; and 900 g.p.m. waterproof pressure tank, $188. Grand total $22,970. **P.W.A.** Bids Oct. 17.

Wis., Milwaukee — Sewerage Comn., setting diffuser plants, to Kroening Eng. Corp., 4500 West Mitchell St., $11,726•••pulling sheet metal piling and furnishing, placing clay and top soil, to Kramp Constr. Co., Berlin, $2,436 and $17,920 respectively•••fence, to Cyclone Fence Co., 733 North Van Buren St., $20,064•••excavation and grading, to P. Scherkenback, Ro... Box 315, $11,946•••removing stone, ... Radtke, 3281 North 13th St., $2,200, ... total $48,292. **P.W.A.** Bids Oct. 18.

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BRIDGES AND GRADE CROSSINGS

PROPOSED WORK

Calif., San Francisco—Golden Gate Brid... & Hy. Dist., 111 Sutter St., San Francisco, aut... ized J. B. Strauss, ch. engr., 111 Sutter st., to make survey of cost of modifying struc... design of Golden Gate Bridge to accommo... rapid transit system. Cost of survey estim... at $15,000.

Colo., Denver—City plans 2 concrete bri... each to have 40 ft. roadway and 5 ft. ... walk, 1 at Stout St. and Speer Blvd., ... at Champa St. and Speer Blvd., $35,000 ... Only one is to be built at this time, w... one is not yet determined. A. K. Vickery, ... and County Bldg., engr.

Ill., Chicago—Comrs. Cook Co. plan 3 ... rein.-con. girder bridge at Lake Ave., North... Twp., incl. 1,035 cu.yd. concrete, 130,450 lb. reinforcing steel, 5,780 c.i. rockers, 1,900 lb. bearing plates, 2 name plates, 100 cu.yd. earth excav., 1,900 cu.yd. backfill, 500 cu.yd. masonry removal, 1,400 cu.yd. channel excav., 1,440 sq.yd. portland cement paving, 2,525 lb. structural steel expansion guard, 5,960 ft. pipe, hand rails, drains, flooring, etc. G. A. Quinlan, 221 North LaSalle St., engr.

Ky., Danville—Southern Ry. and City plan viaduct to be 4 blocks long, on main street to run over railway tracks. City plans to apply to P.W.A. for loan and grant, to pay their part of work. Est. $250,000. R. C. Wyatt, city engr. G. A. McRoberts, mayor.

Mass., Boston—Commonwealth of Massachusetts, Dpt. P. Wks., 100 Nashua St., F. E. Lyman, comr., A. W. Dean, ch. engrs., making preliminary plans rein.-con. and structural steel overpass with bituminous macadam or concrete approaches, Jamaica Way at Huntington St., $290,000.

N. Y., Buffalo—Pennsylvania R.R. Co., T. ... Skillman, ch.engr., Broad St. Sta., Phila., P... making plans 1,200 ft. coal unloading trest... incl. bridge, at Hamburg Turnpike, $1,500,000.

N. Y., Dunkirk—New York Central R.R. Co., W. J. Pfau, ch. engr., 466 Lexington Ave., New York, and Erie R.R. Co., G. S. Fanning, ch. engr., Midland Bldg., Cleveland, O., filed general plans with Pub. Serv. Comn. for eliminating all grade crossings on main line through here, $3,000,000 or more. New York Central will share greater part of the work. **Maturity** 1935.

N. Y., Owego—Erie R.R. Co., G. S. Fanning, ch. engr., Midland Bldg., Cleveland, O., preliminary plans eliminating grade crossing at North Ave. To exceed $25,000. Noted Dec. 1932.

N. Y., Owego—Erie R.R. Co., G. S. Fanning, ch. engr., Midland Bldg., Cleveland, O., preliminary plans eliminating Paige Street Grade Crossing. $25,000.

Ont., Port Arthur—City Council plans bridge over Current River, on Algoma St., $50,000. J. Antonisen, city engr. will prepare a report.

BIDS ASKED

Ind., LaPorte—Nov. 13, by Bd. Comrs. La Porte Co., concrete bridge over channel Stone and Lily Lakes, at Wardner Ave. $17,750. R. W. Leets, aud.

Iowa—Nov. 6, by State Hy. Comn., Ames, 4 rein.-con. pipe and 5 box culverts on U. S. Rd. 71, north of Storm Lake, NRH NRM 37 (... Buena Vista Co.; 22 rein.-con. pipe culverts and 16 rein.-con. box culverts and extensions, NRS 517 Ida and Sac Counties; bridges on Secondary Rd. from P.R. 134 to county line, NRS 448-... Mills Co.; bridge on Secondary Rd. between Sects. 22 and 23, T70N, R20W, Wayne Co. P.W.A. projects. F. R. White, ch. engr.

Kentucky—See "Streets and Roads."

Massachusetts—Nov. 6, by chn. Bd. of Selectmen of towns of Dover and Sherborn, at office of F. E. Lyman, comr. Dpt. P. Wks., 100 Nashua St., Boston, for six 16 ft. creosoted pile and timber bridge, 325 sq.yd. type "D" bituminous surface and 600 ft. tar treated gravel surface approaches, State Aid Project, between Dover and Sherborn. To exceed $10,000. Commonwealth of Massachusetts, Dpt. P. Wks., A. W. Dean, ch. engr., 100 Nashua St., Boston.

N. Y., Buffalo—Nov. 13, by W. W. Zittel, clk. Bd. Supervs. Erie Co., constructing Bridge 583, Genesee Rd., Sardinia; Bridge 623, Amherst Villa Rd., Amherst and Cheektowaga; Bridge 742, Burton Rd., Orchard Park Bridge, 780, Kellar Rd., Eden; Bridge 795, Polish Hill Rd., Boston; Bridge 450, Murray Rd., Colden; Bridge 522 Zoar Valley Rd., Collins; Bridge 556, North St., Concord; Bridge 248, Abbott Rd., Lackawanna. **P.W.A.** project.

†Federal Government

Bridges, etc. (Continued)

North Dakota—Nov. 8, by State Hy. Dpt., Bismarck, timber bridge on state highway west of Carrington, NRH 101, Foster Co. T. G. Pionasen, hy. comr.

O., Cleveland—Nov. 16, by O. W. Merrell, dir. Hys., Columbus, 1,260.7 ft. steel arch viaduct and approaches consisting of two 256 ft. and 236.7 ft. spans, five steel beam approach spans, 40 ft. roadway, two 5 ft. sidewalks over Rocky River and Cleveland Metropolitan Park, Lorain Ave., Sect. "Cleveland" (Fairview Bridge), Cleveland-Oberlin Rd., $547,669, approaches and landscaping $39,131.

Oklahoma—Nov. 7, by State Hy. Dpt., Oklahoma City, constructing 6 span 480 ft. steel truss bridge on concrete piers at Lindsay, Garvin Co., $26,929; ***11 span 880 ft. steel truss bridge on piers, Eufaula, McIntosh Co., $109,000. C. L. Wilson, state hy. engr.

South Dakota—Nov. 8, by State Hy. Comn., Pierre, constructing bridge in Hand Co.; guardrail in Turner, Bennett, Mellette, Pennington, Day, Perkins, Meade, Fall River, Todd, Potter, Lincoln, Union and Tripp Counties. F. D. Kriebs, secy.

Texas—Nov. 8, by G. Gilchrist, state hy. engr., Austin, constructing Lampasas River Bridge, consisting of four 40 ft. I-beam spans, 1 unit of two 108 ft. anchor and one 63 ft. suspended deck plate girder spans, etc., Hy. 2, NRH 644-A, Bell Co., $40,000. P.W.A. project. D. M. Puckett, Waco, engr. Noted Oct. 25.

CONTRACTS AWARDED

Calif., Sacramento—Sacramento Co., constructing trestle at Benson Ferry on Lower Stockton Rd., 25 mi. south of here, involving furnishing 8,888 lin.ft. piles, driving 5,520 lin.ft. piles, 21,000 MFBM r.w. caps and dirt top, 7.2 MFBM r.w. X-bracing, 196,992 MFBM r.w. stringers, scabs and bridging, 57,736 r.w. subfloor, 505.2 cu.yd. concrete, 98,814 lb. reinforcing steel, 100 cu.yd. excav. and backfill, removing old trestle, to Lord & Bishop, Box 355, Oroville, $40,305. Bids Oct. 1.

Ill., Chicago—Cook Co., County Bldg., bridges at Lincoln Ave., to M. J. McDermott Co., 53 West Jackson Blvd., $137,422 est. $100,000; in New Trier Twp., to Arcole Constr. Co., 5150 Church St., Niles Center, $37,802. Bids Oct. 3.

Iowa—State Hy. Comn., Ames, to E. A. Wickham, Council Bluffs, culverts and bridge in Adair Co., $4,507; in Audubon Co., $9,744, both P.W.A.; bridge in Pottawattamie Co., $6,402 ***to Waugh & Tackman, Clarksville, culverts in Clayton Co., $18,788***to C. W. Boltz, Indianola, culverts in Decatur Co., $3,102 ***to Wickes Eng. & Constr. Co., 1441 Bluff St., Des Moines, bridge in Decatur Co., $2,875 ***to Brown & Rummel, Williams, culverts in Mills Co., $1,992***to Griffis Bros. Constr. Co., Wellman, culverts in Harrison Co., $26,793*** to B. Cole & Son, Ames, culverts in Ringgold and Taylor Counties, $26,615***to Kelley & Overman, Villisca, bridges and culverts in Taylor Co., $9,711***to Duvall & McKinney, Logan, bridges in Taylor Co., $6,993***bridge in Wright Co., to E. A. Krammer & Son, Des Moines, $24,186, all foregoing P.W.A.***to M. O. Burnett, Marengo, culvert in Tama Co., $1,066 ***to Christensen Bros., Sioux City, culvert in O'Brien Co., $2,336***to Hoak Constr. Co., 1007 Hubbell Bldg., Des Moines, 4,700 lin.ft. guard rail in Polk and Dallas Counties, $1,778. Grand total $146,888. Bids Oct. 23, awarded Oct. 24 and 26. Noted Oct. 18.

Kansas—State Hy. Comn., at office County Clerk, Winfield, eight 25 ft. steel beam span bridge and seven 30 ft. rein.-con. deck girder span bridge, to Maxwell Constr. Co., Columbus, $9,375 and $16,303 respectively***three 10x10x44 ft. rein.-con. bridge, and three 7x3x36 ft. rein.-con. bridge, to Lay Constr. Co., Kansas City, Mo., $3,500 and $434 respectively, foregoing on Project 160-29-NRH 368-F, Cowley Co. Grand total $29,612. **P.W.A.** Bids Oct. 19.

Kentucky—See "Streets and Roads."

Maine—See "Streets and Roads."

Mass., Townsend—See "Waterworks."

Minnesota — State Hy. Comn., St. Paul, constructing Bridge 5269, State Project 23-25-29-1, NRS 457-B, near Belle Plaine, and Bridge 5057, S.P. 16-9-38, NRH 311-C, near Welcome, Martin Co., to Dunnigan Constr. Co., 606 Builders Exch. Bldg., St. Paul, $29,983 and $13,480 respectively***bridge 5397, S.P. 60-73-21-1A, NRS 480C, southwest of Wabasha, Wabasha Co., to Nolan Bros., 18 North 2nd St., Minneapolis, $14,933. Grand total $58,396. **P.W.A.** Bids Oct. 19.

Mo., St. Louis—City, c/o Bd. P. Wks., constructing 802 ft. viaduct over Manchester Ave. and River Des Peres and tracks of Missouri, Pacific & St. Louis & San Francisco Railroads, to McCormick Combs Constr. Co., Columbia Bldg., St. Louis, $245,897. Est. $360,000. **P.W.A.** Bids Oct. 16, awarded Oct. 23. Noted Sept. 27.

New Hampshire and Vermont—State Hy. Dpts., Concord, N. H., and Montpelier, Vt., 625 ft. steel deck plate girder bridge over Connecticut River, between Hanover, N. H., and Norwich, Vt., to Davison Constr. Co., Manchester, N. H., $135,237; 256 ft. steel truss bridge over Peniginasset River between Plymouth and Holderness, Grafton Co., to Lackawanna Steel Constr. Corp., Walden Ave., Cheektowaza, Buffalo, N. Y., $47,492 est. $75,000. **P.W.A.**

New Jersey—State Hy. Comn., Trenton, demolishing bridges over Hackensack River, Bergen Co., to Yeoman-Drew Co., 880 Bergen Ave., Jersey City, $53,500. Bids Sept. 24, awarded Oct. 23. Noted Sept. 13.

North Dakota—See "Streets and Roads."

Oklahoma—State Hy. Dpt., Oklahoma City, bridges at Miami, Ottawa Co., and at Barnsdalle, Osage Co., to M. E. Gillioz, Monett, Mo., $127,171 and $103,938 respectively est. $440,000 and $110,000 respectively***bridge in Broken Bow, McCurtain Co., to Pharoah & Co., Henryetta, $25,327 est. $27,000. Grand total $256,436. Bids Oct. 16.

Virginia—State Hy. Dpt., Richmond, bridge in Loudoun Co., to Blackwell & Constr. Co., Warrenton, and to Alley Constr. Co., Bristol, $22,021***bridge in Augusta Co., to R. W. Moore & Co., Staunton, $9,005***in Shenandoah Co., to Clark & Lewis, Luray, $37,916***bridge over Rohoic Creek and railway crossing, Dinwiddie Co., to R. K. Williams, Inc., Richmond, $11,351 and $17,220 respectively. Grand total $97,513. **P.W.A.** Bids Oct. 16 and 23. Noted Oct. 4 and 11.

Wisconsin—State Hy. Comn., Madison, constructing 4 bridges in Crawford Co., to T. J. Molzahn & Sons, Inc., 205 Security Bank Bldg., LaCrosse, $30,992. Bids Oct. 16. Noted Oct. 4, under "Streets and Roads."

STREETS AND ROADS

BIDS ASKED

California—Nov. 14, by State Hy. Comn., Sacramento, grading, crushed run base and bituminous surface treating 2.7 mi. hy. between point 3 mi. east of Half Moon Bay and Summit, San Mateo Co. C. H. Purcell, P. Wks. Bldg., Sacramento, engr.

Connecticut—Nov. 5, by State Hy. Dpt., State Office Bldg., Hartford, bituminous macadam on broken stone paving 23,846 ft. Route 202, Killingly; asphalt on concrete paving 1,071 sq.yd. intersection Edgewood Ave. and Boulevard, New Haven; 6,367 ft. U. S. Route 6, West Hartford; rein.-con. paving 6,450 ft. Bristol; bituminous macadam and sheet asphalt on concrete paving 2,785 ft. Farmington Ave.; waterbound macadam paving 8,550 ft. North St. Route 85, Hebron. To exceed $25,000. J. A. Macdonald, State Hy. Dpt., Hartford, comr.

Florida—Nov. 8, by State Road Dpt., Tallahassee, grading 1.515 mi. Rd. 4, NRH 143-A, Duval Co., $50,000; clearing, grubbing, grading, sand clay surface treating, drainage structures 2.103 mi. Rd. 37, Project 837, Santa Rosa Co.; rein.-con. paving 0.237 mi. Rd. 1, NRM 109-C, Escambia Co., $24,000; sand clay surfacing 2.664 mi. Rd. 37, NRS 14, Santa Rosa Co., $30,000.

Idaho—Nov. 9, by G. E. McKelvey, comr. P. Wks., graveling 6.881 mi. Twin Falls Loop between Twin Falls and Godwin, Twin Falls Co., incl. 35,000 cu.yd. unclassified excav.

Iowa—Nov. 6, by State Hy. Comn., Ames, concrete paving 3.964 mi. U. S. Rd. 71, out of Storm Lake, NRH and NRM 37CD, Buena Vista Co., incl. 61,470 cu.yd. excav.; reconstructing paving 1.006 mi. U. S. 65, in Indianapolis, NRM 11D, Warren Co., 5,005 cu.yd. excav.; grading 8.762 mi. Secondary Rd. east from northeast corner Sect. 6, T88N TR 39W, 171,341 cu.yd. excav.; 0.699 mi. Primary Rd. 37 between Onawa and Turin, NRH NRM 426 CD, Monona Co., 19,433 cu.yd. excav., all foregoing P.W.A. projects; paving culverts, sidewalks on F-417, Primary Rd. 12, Plymouth Co.; grading 0.227 mi. Primary Rd. 5, P-39, Plymouth Co., incl. 4,968 cu.yd. excav.; graveling 5.167 mi. Primary Rd., out of Akron North, F-417, Plymouth Co.; 6 mi. out of Calmar southeast, F-357, Winneshiek Co. F. R. White, ch. engr.

Kentucky — Nov. 9, by State Hy. Comn., Frankfort, high type surfacing 0.165 mi. Winchester Ave., Ashland, NRM 201 BS, Boyd Co.; 0.426 mi. West Main St., Lexington, NRM 326 DS, Fayette Co.; 1.103 mi. street in Somerset on Somerset-Russell Springs Rd., NRHM 211 AS, Pulaski Co.; bridge over Fugitt Creek on Harlan-Clover Splint Rd., NRS 344 AB, Harlan Co.; low type surfacing 5.433 mi. Hindman-Lackey Rd., NRH 237 AS, Knott Co.; grading, draining 3.023 mi. Brandenburg-Battletown Rd., NRS 278 BG, Meade Co.; 3.257 mi. Howardstown-Raywick Rd., NRS 347 AG, Nelson Co.

Maine—Nov. 7, by State Hy. Comn., L. D. Barrows, ch. engr., Augusta, gravel surfacing 6.84 mi. Project NRH 1, Bowdoin and Richmond, $180,000.

Minnesota—Nov. 9, by State Hy. Dpt., St. Paul, grading, concrete paving 8,861 sq.yd. State Project 16-9-45-6 NRM 61-C, Albert Lea, incl. 25,575 cu.yd. excav.

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†*Federal Government.*

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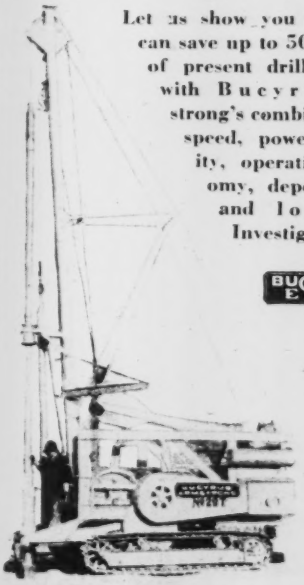

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FEDERAL PROJECTS NUMBER

ENGINEERING NEWS-RECORD

Nov. 29, 1934

The demand for "extra copies" naturally will be heavy—orders should be placed early—25c a copy.

Streets and Roads (Continued)

New Hampshire—Nov. 8, by State Hy. Dpt., Concord, crushed gravel or gravel surfacing 39,084 cu.yd. South Side Rd., Raymond and Epping, Rockingham Co., involving 38,152 cu. yd. earth and 12,182 cu.yd. ledge rock excav., $100,000; 2,048 cu.yd. Stark Hy., Hopkinton, Merrimack Co., 3,108 cu.yd. earth and 225 cu.yd. ledge rock excav., $10,000; gravel surfacing 4,993 cu.yd. Daniel Webster Hy., Campton, Grafton Co., involving 10,369 cu.yd. earth and 1,540 cu.yd. ledge rock excav., $31,000.

New York—Nov. 13, by A. W. Brandt, comr. Hys., Albany, preliminary grading, etc., road in Queens Co.; graveling roads in Chautauqua, Chemung, Genesee, Livingston, Oswego, Sullivan, Tioga, Washington, and Westchester Counties; reconstructing roads in Delaware, Otsego and Orange Counties.

N. Y., Brooklyn—Nov. 9, by R. V. Ingersoll, pres. Brooklyn Boro, Boro Hall, grading, asphalt on concrete paving Denton Pl., Cooper, Hart, Herkimer and Scholes Sts., grading, flagging Avenue Z, Williams Ave., and East 38th St.

North Carolina—Nov. 7, by State Hy. and P. Wks., Raleigh, gravel surfacing 9.92 mi. hy. between Enfield and Tillery, Project 161, Halifax Co., $44,257, structures on same road $5,375; bituminous surface treating 0.83 mi. hy. between Beaufort and Atlantic Rd., Project 2033, Carteret Co., $3,167; bituminous concrete surfacing 0.24 mi. hy. Goldsboro, Project 2800, Wayne Co., $6,000; grading, crusher run stone and structures 6.98 mi. hy. Newton, toward intersection Route 17, Project 6290 Catawba Co., $80,315; structures on same road $27,575; grading, top-soiling, crusher run stone paving 11.65 mi. Project 6410, Iredell Co., $87,306; structures on same road $30,975; concrete paving 0.13 mi. hy. Lincoln, Project 6481, Lincoln Co., $7,880. W. V. Baise, Raleigh, acting engr.

Ohio—Nov. 9, by O. W. Merrell, dir. Hys., Columbus, brick paving, incl. furnishing, delivering brick, landscaping both sides of hy. and removing old concrete wearing surface, waterproofing expansion joints, excavating channel, placing rip rap wall, placing brick wearing surface and marginal wearing surface on bridge, 1.602 mi. Sects. "D-2" and "K-2" (part) Logan-Athens Rd., Athens Co., $92,481; high strength concrete paving 0.35 mi. Sect. "G" (part) National Rd., Guernsey Co., $17,297***concrete paving 2.042 mi. Sects. "S" (part) "U" (part) Ohio River Rd., Monroe and Washington Counties, $68,663. Cancelled bids to have been opened Nov. 9, for brick paving, incl. furnishing, delivering brick 0.313 mi. Sects. "P" and "P-1" (part) Newcomerstown-Uhrichsville Rd., Tuscarawas Co., $70,627, this is likely to be advertised for on Nov. 16.

Oklahoma—Nov. 7, by State Hy. Dpt., Oklahoma City, grading, draining 5.71 mi. State Hy. 17, south of Stillwell, Adair Co., 36 ft. $57,000. C. L. Wilson, state hy. engr.

Oklahoma—Nov. 7, by State Hy. Dpt., Oklahoma City, grading, drainage 10.41 mi. State Hy. 19, Garvin Co., 36 ft., $43,022. C. L. Wilson, state hy. engr.

Pennsylvania—Nov. 9, at office S. S. Lewis, secy. Hys., Harrisburg, widening existing pavement on each side with rein.-con., 6,050 ft. R-157, Sect. 9, Reading, Muhlenberg Twp., Berks Co., involving 15,861 cu.yd. Class 1 excav.; rein.-con. paving 7,253 ft. R-953, Sect. 1 C.A. Appls. 9651 and 9652, Clarks Summit and Clarks Green Boros, South Abington Twp., Lackawanna Co., 8,262 cu.yd. Class 1 and 531 cu.yd. Class 2 excav.; rein.-con. widening 13,359 ft. R-146, Sect. 1, West Norriton and Lower Providence Twps., Montgomery Co., 5,635 cu.yd. Class 1 and 365 cu.yd. Class 2 excav.

Pa., Oakdale—Nov. 7, by R. L. Woodside, controller Allegheny Co., Pittsburgh, sub-grade and constructing bituminous limestone rock asphalt seal coat paving 2.6 mi. Thomas Run and Oakdale Rd., near here. E. L. Schmidt, County Office Bldg., Pittsburgh, engr.

Pa., Warren—See "Contracts Awarded."

R. I., Providence—Nov. 5, by City, F. S. Nolan, comr. P. Wks., City Hall, bituminous macadam paving South Water St. To exceed $25,000.

South Carolina—Nov. 13, by State Hy. Dpt., Columbia, removing old gutter and replacing with concrete 5 blocks Main St., Columbia, removing old pavement and replacing with sheet asphalt on concrete base 2 blocks same street, etc., NRM 45 Sect. C, parts 1 and 2, Richland Co., $27,000; widening concrete culverts, etc., State Route 2, NRH 159 and NRH 279 and NRH 282, Dorchester Co., $20,000.

South Dakota—Nov. 8, by State Hy. Comn., Pierre, grading roads in Hand, Hyde, Walworth and Sauk Counties; graveling roads in Clark, Hutchinson, Codington, Sanborn, Dewey, Ziebach, Perkins, Bennett, Mellette, McPherson, Roberts, Clark, Spink, Lincoln, Union, Haakon, Stanley, Butte, Corson, and Deuel Counties; resurfacing roads in Codington, Potter, Dewey, Deuel and Tripp Counties. F. D. Kriebs, secy.

†**Washington**—Nov. 7, by Pub. Rds., Portland, Ore., improving National Forest Rd., Columbia Natl. Forest, Skamania Co. W. H. Lynch, dist. engr.

†**Wyoming**—Pub. Rds., Denver, Colo., soon takes bids bituminous surfacing by plant mix method 19.5 mi. Grand Loop Hy., from Canyon Hotel to Tower Junction; base course and plant mix bituminous top course 4 mi. Grand Loop Hy.; grading, draining roadbed 22 mi. East Entrance approach road to Yellowstone Natl. Park, P.W.A. projects. Contractors interested advised to examine premises at this time as roads will be inaccessible when bids are called. Contractors interested to contact C. F. Capes, at Field Office, Mamoth, Yellowstone Park.

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CONTRACTS AWARDED

†**Arizona**—Pub. Rds., Phoenix, grading, draining, roadbed, 3.172 mi. Sect. E, Cameron-Desert View Approach Rd. to Grand Canyon Natl. Park, Coconino Co., to S. Kousen Bros., Albuquerque, N. M., $44,577. Est. $51,479. Noted Sept. 25.

Arizona—State, Hy. Comn., Phoenix, aggregate base course and oil processing 13.7 mi. Holbrook-Lupton Hy., to Arizona Sand & Rock Co., Phoenix, $83,721***6.2 mi. Ash Fork-Kingman Hy., to N. G. Hill & Co., 1145 West Culver St., Phoenix, $39,277***widening concrete paving streets in Chandler, to Clinton Campbell, Phoenix, $6,481. Grand total $129,479. **P.W.A.** Bids Oct. 3. Noted Sept. 20.

Colorado—State Hy. Dpt., Denver, gravel surfacing 2.216 mi. hy. east and west of Dumont on State Hy. 2, NRH 181-D, Clear Creek Co., to Prell-Hall & Allison, Grand Junction, $55,845. Bids Oct. 13, awarded Oct. 22.

†**Colorado**—Pub. Rds., Denver, Colo., surfacing 1.633 mi. road in Archuleta Co., to Mackey & DeRemer, 1810 Blake St., Denver, $39,389. Bids Oct. 2, awarded Oct. 20. Noted Sept. 27.

Florida—State Roads Dpt., Tallahassee, 8½ in. Ocala limerock base surface treated paving 0.315 mi. NRM 146, Rd. 5, Citrus Co., to L. B. McLeod, Williston, $4,207***concrete paving 3.598 mi. NRH 99-C, Rd. 5, Hillsborough Co., to H. E. Wolfe Constr. Co., St. Augustine, $110,972***clearing, grubbing, grading, 79,226 sq. yd., Ocala limerock base course (double course) 8¼ in. thick, bituminous surface treatment, etc., 83,044 sq.yd. NRS 120 (1935) Rd. 19, Volusia Co., to Manley Constr. Co., Ocala, $132,599. Grand total $247,778. **P.W.A.** Bids Oct. 23, awarded Oct. 23.

Florida—State Road Dpt., Tallahassee, 8½ in. Ocala limerock base (double application) with single application bituminous surface treating 2.826 mi. Project 520, Rd. 2, Marion Co., to M. J. Carroll, Inc., Ocala, $28,549. Bids Oct. 25, awarded Oct. 25. **P.W.A.**

Georgia — State Hy. Bd., Atlanta, grading 8.183 mi. Chipley-La Grange Rd., Troup Co., to Whitley Constr. Co., La Grange, $128,029; grading 5.935 mi. Warrenton-Crawfordville Rd., State Aid Project 360 and 595, Warren Co., to W. L. Florence Constr. Co., Powder Springs, $27,867. Bids Oct. 18.

†**Idaho**—Pub. Rds., Ogden, Utah, reconstructing 4.313 mi. road in Fremont Co., to Strong & Grant, Springville, Utah, $95,823. Est. $115,243.

Ill., Paris—Dpt. P. Wks. & Buildings, Div. Hys., traffic bound macadam surface course paving 4.1184 mi. Sect. P-M.F.T., near Buck Twp., Edgar Co., to Orville Arnold, Casey, $33,068.

Indiana—State Hy. Comn., Indianapolis, bit. mulch-liquid asphalt paving 8.1 mi. road in Tippecanoe Co., to Road Resurfacing Co., Bloomington, $31,763***8 mi. Tippecanoe Co., to H. A. Carpenter, Brazil, $30,114***7.7 mi. in Tippecanoe Co., to Bituminous Material Co., Terre Haute, $28,911***4.5 mi. Boone Co., to A. W. Taylor & Co., La Porte, $19,942. Grand total $110,730.

Iowa — State Hy. Comn, Ames, 0.356 mi. Jefferson Co., to C. H. Kearns, Fairfield, $13,201 *** 0.85 mi. Pottawattamie Co., to P. Kiewitt Sons Co., 1024 Omaha Natl. Bank Bldg., Omaha, Neb., $55,328*** grading 3.483 mi. Adair Co. and 1.924 mi. Audubon Co., to A. Schroeder, 1011 West Capitol Dr., Milwaukee, Wis., $6,216 and $7,541 respectively***5.011 mi. Clayton Co., to T. Ryan & Sons, Missouri Valley, $27,596 ***2.001 mi. Decatur Co., to Naylor Bros., 2467 North 45th St., Omaha, Neb., $6,456 ***5.389 mi. Harrison Co., to J. A. Carlson Constr. Co., Omaha, Neb., $29,040***7.244 mi. Mills Co., to J. Stanley, Thurman, $2,782 ***6.749 mi. Ringgold and Taylor Counties, and 4.065 mi. Taylor Co., to G. W. Little, Newton, $25,631 and $14,419 respectively*** graveling 12.626 mi. Adair Co., to C. A. Emery, Coon Rapids, $18,700***6.989 mi. Iowa Co., to Interstate Constr. Co., Madison, Wis., $13,193***4.871 mi. Iowa Co., to S. P. Moore, Cedar Rapids, $8,490, all foregoing **P.W.A.** ***graveling 10.725 mi. in Ringgold and Taylor Counties, to E. F. Kibbey, Carlisle, $25,838. Grand total $254,411. Bids Oct. 10, awarded Oct. 24 and 26. Noted Oct. 18.

Kansas—State Hy. Comn., at office of County Clerk, Winfield (**P. means Project**), to San-Ore Constr. Co., McPherson, bit. mat. surfacing Class C-1, (trav. pet. method) 0.15 mi. P. 50N-13 NRH 363-A-1, $500; 0.579 mi. P. 50N-13 NRM 383-A-2, $2,042, both Barton Co.; sand gravel surfacing 10 mi. P. 50N-16A-6279, Rice Co., $1,940***to A. L. Cook, Ottawa, concrete paving 0.518 mi. P. 77-8 NRM 240E, Butler Co., $18,087; roadside improvement 7.736 mi. P. 160-29 NRH 368-F, Cowley Co., $1,330*** to Stamey & Tidd, Hutchinson, 0.518 mi. P. 77-8 NRM 240 E, Butler Co., $124; 0.205 mi. P. 77-2 NRM 230 G, Cowley Co., $64; 0.64 mi. P. 160-28 NRH 368 G, Sumner Co., $74 ***to Winfield Constr. Co., Winfield, concrete paving 0.205 mi. P. 77-2 NRM 230 G, Cowley Co., $8,614***to D. L. Wheelock, Clay Center, earthwork and culverts 0.64 mi. P. 160-28 NRH 368 G, Sumner Co., $14,131***to Schirmer & Bennett, Kansas City, Kan., 7.736 mi. P. 160-29 NRH 368 F, Cowley Co., $48,072. Grand total $95,678. **P.W.A.** Bids Oct. 19.

Kentucky—State Hy. Comn., Frankfort, grading, draining 2.4 mi. Round Hill-Caneyville Rd., S.P. 1204-AG, Edmonson Co., to Ruth Bros., Frankfort, $25,799, bids May 24***grading 3.492 mi. Greensville-Hopkinsville Rd., S.P. 10-GG, Muhlenberg Co., to J. F. Mulligan Inc., Eastview, $23,989, bids June 14***grading, draining 1.839 mi. Hayes-Olive Hill Rd., S.P. 47-AG, Rowan Co., to R. Myers, Campbellsburg, Ind., $44,275, bids June 28***6.143 mi. S.P. 399-AG, Fleming and Lewis Counties, and bridge over Little Goose Creek, on Manchester-Mt. Ree Rd., S.P. 30-AB, Clay Co., to Codell Constr. Co., Winchester, $56,145 and $20,309 respectively, bids July 12. Grand total $170,517. Bids May 24, June 14, 28 and July 12.

Maine—State Hy. Comn., L. D. Barrows, ch. engr., Augusta, to Wyman & Simpson, Inc., 284 Water St., Augusta, bituminous concrete sidewalks, Project NRM 129-C, Ellsworth, $2,514; bituminous macadam paving 0.72 mi. Project NRH 91-G, Bucksport, $41,480; bituminous macadam paving 0.85 mi. NRH 150-D, Fairfield, $26,330***to Hector J. Cyr, Inc., Waterville, Cove Bridge, Project NRH 84-C, Winterport, involving 395 cu.yd. rein.-con., $10,343. Grand total $80,667. Bids Oct. 10, awarded Oct. 23.

Mass., Boston—City, Dpt. P. Wks., C. J. Carven, comr., sheet asphalt paving La Grange St., Sect. A, Ward 20, in West Roxbury, to M. F. Gaddis, 6 Beacon St., $35,104. **P.W.A.** Bids Oct. 8, awarded Oct. 19. Noted Oct. 4.

Mass., Boston—City, P. Wks. Dpt., C. J. Carven, comr., City Hall Annex, sheet asphalt paving Greaton Rd. from Centre St., to Frank J. Jacobs Co., 1718 Centre St., West Roxbury, $7,441 (not P.W.A.); bitulithic paving old Colony Ave., Sect. "B" Dorchester St. to Mount Vernon St., to Warren Bros. Roads Co., 38 Memorial Dr., Cambridge, $63,871. **P.W.A.** Awarded Oct. 23. Noted Sept. 27.

Michigan—State Hy. Comn., Lansing, grading, shaping, structures, drainage, concrete paving 0.731 mi. Montgomery Co., to Gould & Cross, Grand Rapids, $35,129; grading, shaping, drainage structures, concrete paving 0.708 mi. Kent Co., to Remus Constr. Co., Remus, $50,052. **P.W.A.** Bids Oct. 5.

Michigan—State Hy. Dpt., Lansing, two-course gravel surfacing 6.906 mi. NRH 2-19C-2, Alger Co., to I. L. Whitehead, Saulte Ste. Marie, $42,903***3.332 mi. NRH 52-27C-5, Marquette Co., to R. B. Vickery Co., Suamico, Wis., $17,086***grading, shaping sidewalk area and constructing concrete sidewalks on 0.472 mi. between Fisher and Hampton Sts., NRM 52-25C-3, Marquette Co., to L. W. Brumm, Marquette, $2,998***grading, concrete paving 3.617 mi. NRH 63-45C-2, Oakland Co., to Ray Sablan, Lansing, $119,427***grading, shaping, drainage structures, concrete paving 0.485 mi. NRM 33-29C-2, Kalamazoo Co., to P. Vanderveen & Son, Grand Rapids, $27,888. Grand total $210,302. **P.W.A.**

Minnesota—State Hy. Dpt., St. Paul, grading 7.2 mi. S.P. 28-28-26-2, NRH and M 240 A and B, to Lobnitz Bros., Willmar, $18,781*** 4.6 mi. S.P. 95-132-21-1, Div. B, NRS 478-B, to DeRuyter Bros., Willmar, $27,810***1.9 mi. S.P. 34-182-21-1, Div. A, to J. Dieseth, Fergus Falls, $11,458***grade lift 4.6 mi. S.P. 28-28-28-26-2, NRH and M 340 A and B, to Megarry Bros., Bain, $41,628***bituminous treating 23.7 mi. S.P. 7-66-22-1, 7-66-21-2 A and B, 7-66-21-2 NRH and M 437 B1 and B2, S.P. 7-66-21-4 NRH 437 A, S.P. 7-66-21-5, NRH and M 437 C1 and C2, to J. W. Craig Co., 1814 Northeast California St., Minneapolis, $82,249. Grand total $181,926. **P.W.A.** Bids Oct. 12. Noted Oct. 4.

Mississippi — E. D. Kenna, dir. State Hy. Comn., Jackson, to G. L. Tarlton, 411 North 7th St., St. Louis, Mo., alternate types paving 5.971 mi. Jackson-Hattiesburg Hy., Rankin and Simpson Counties, $101,882 est. $139,000. 2.43 mi. Magee-Mendenhall Hy., Simpson Co., $46,110 est. $59,000***to C. Weaver, Milwaukee, Wis., grading, drainage structures, bridges 7.469 mi. Pickens-Durant Hy., Holmes Co., $69,907 est. $82,000***to T. L. James, Ruston, La., grading, drainage structures, alternate types paving 1.551 mi. Columbia-Foxworth Hy., Marion Co., $23,377 est. $31,000***to Hartman-Clark Constr. Co., Peoria, Ill., grading, drainage structures, bituminous surfacing 1.191 mi. Fayette-Harrison Hy., Jefferson Co., $24,997 est. $26,000; alternate types paving 1.411 mi. Vicksburg-Jackson Hy., Hinds and Warren Counties, $39,403 est. $25,000; grading, drainage structures, bridging 8.324 mi. Secondary Hy., Leake and Attalla Counties, $58,296 est. $68,000***to S. B. Boyd, Columbia, grading, drainage structures, bridging 2.139 mi. Brandon-Raleigh Hy., Smith and Rankin Counties, $38,185 est. $43,000. Grand total $402,157. **P.W.A.** State Hy. Dpt. deferred award for furnishing 2 units structural steel I-beam spans for underpass on Meridian-Hattiesburg Hy., Jones Co.; grading, drainage structures, bridges, bituminou-

†*Federal Government*

Streets and Roads (Continued)

surfacing 0.578 mi. Forest-Morton Hy., Scott Co., $35,000; grading, drainage structures, bridging 0.203 mi. Meridian-Hattiesburg Hy., Jones Co., $88,000. Withdrew from Oct. 16 letting grading, drainage structures, surfacing 0.938 mi. Hattiesburg-Mobile Hy., George Co., $20,000, will re-advertise. Noted Oct. 11.

Nebraska — State Dpt. Roads & Irrigation, Lincoln, to Abel Constr. Co., 900 North 16th St., Lincoln, and Theisen Bros., Osmond, grading 4.9 mi. Clay Co., $13,970; 0.7 mi. Furnas Co., $22,634; 0.6 mi. Furnas Co., $36,852*** to E. W. Nichols, Geneva, culverts in Clay Co., $4,729; sand graveling 18.1 mi. Fillmore Co., $6,803; 8.9 mi. Thayer Co., $2,271; 8.5 mi. Fillmore Co., $3,033***to J. E. Tift, Grand Island, grading 13 mi. Lincoln Co., $34,509; 5.8 mi. Keith Co., $21,289***to Dobson & Robinson and Abel Constr. Co., Lincoln, 1 mi. Lincoln Co., $24,359***to Yant Constr. Co., 440 Grand Exch. Bldg., Omaha, 4.9 mi. Douglas Co., $252,385; bridge in Douglas Co., $29,042; viaduct same county, $27,079; sand graveling 11.4 mi. Madison and Wayne Counties, $3,010***to Third City Sand Co., Grand Island, sand graveling 12 mi. Bassett and Harrop Counties, $3,643; 8.2 mi. Valley Co., $1,806; 2.4 mi. Boyd and Holt Counties, $957***to Hawke & Camp, Gibbon, 15 mi. Rock Co., $3,663; 12.6 mi. Hamilton, Clay and York Counties, $3,496***to Roberts Constr. Co., Lincoln, 0.6 mi. in Holt Co., $12,851; 3.4 mi. Dawes Co., $1,329; 3.5 mi. Dawes Co., $1,390***to E. A. Wickham, Council Bluffs, Ia., and F. Moran, Omaha, 3.9 mi. Cass Co., $98,646***to Dobson & Robinson, Lincoln, 0.7 mi. Johnson Co., $21,199***to V. M. Haddon, Valley, 20.6 mi. Dundy Co., $7,433***to Inland Constr. Co., 3867 Leavenworth St., Omaha, 8 mi. Cuming Co., $2,630; 2.1 mi. Boyd and Holt Counties, $1,505; 9.3 mi. Dakota and Thurston Counties, $2,959; 5 mi. Brown Co., $2,279***to J. N. Ehnung, Wayne, 11.1 mi. Thurston Co., $4,127; 8.5 mi. Dixon Co., $2,736; 15.5 mi. Dixon, Wayne and Cedar Counties, $4,137; 8.7 mi. Knox Co., $1,520***to Carstenson Sand Co., Columbus, 2.2 mi. Nance Co., $524; 13.5 mi. Madison Co., $2,088; 7.1 mi. Platte Co., $1,451; 2.5 mi. Nance Co., $361; 20.6 mi. Boone and Madison Counties, $7,172; 9.6 mi. Nance Co., $1,759; 11.4 mi. Nance Co., $2,272; 13.1 mi. Garfield Co., $4,304***to J. N. Ball, Omaha, 8.6 mi. Lancaster and Saline Counties, $2,812***to Abel Constr. Co., 900 North 16th St., Lincoln, 4 mi., Gage and Lancaster Counties, $1,795; 8 mi. Otoe Co., $2,365; 2.6 mi. Sarpy Co., $624; 11.6 mi. Burt and Thurston Counties, $3,355***to M. M. Lippincott, Hastings, 12.3 mi. York Co., $4,418; 12 mi. Greeley, Nance and Howard Counties, $2,772; 5.5 mi. Hamilton Co., $770***to J. E. Shearer & Sons, Hebron, 10.2 mi. Jefferson Co., $2,409***to Allen Davison Co., Beatrice, 6.8 mi. Gage Co., $1,643; 15.1 mi. Johnson, Nemaha and Pawnee Counties, $7,378; 8.4 mi. Jefferson Co., $1,822*** to I. S. Eager, Fremont, 5.6 mi. Polk and Butler Counties, $1,433***to M. M. Liggett, Benedict and Meridian Constr. Co., York, 21 mi. York and Stewart Counties, $6,651***to Steel Bros., Dorchester, 5.2 mi. Saline Co., $1,402***to Keim Constr. Co., Tecumseh, 4.1 mi. Cass Co., $1,706***to D. H. Merritt & Sons, Lincoln, 5.8 mi. Lancaster and Saunders Counties, $3,066***to T. W. Gravel Co., Tekamah, 11.4 mi. Burt Co., $3,307***to Plainview Gravel Co., Plainview, 15.7 mi. Knox Co., $5,303***to Weidner & King, Fremont, 17.9 mi. Stanton and Colfax Counties, $4,615***to P. C. Baker, Morrill, 5.9 mi. Cheyenne and Morrill Counties, $898***to M. M. Liggett, Benedict, 5.8 mi. Sheridan Co., $2,158***to G. E. Smith Co., Lincoln, culverts in Lincoln Co., $12,097*** to Diamond Eng. Co., Grand Island, bridge in Lincoln Co., $4,102; culverts in Keith Co., $2,642. Grand total $761,747. **P.W.A.** Rejected bids Oct. 18 constructing 4.4 mi. road in Boyd Co.

†**New Mexico**—Pub. Rds., Denver, Colo., surfacing 8,548 mi. road in Arriba Co., to Wheeler, Carrico & Silver, Albuquerque, $41,018. Bids Oct. 2, awarded Oct. 20. Noted Sept. 27.

N. Y., Buffalo—Erie Co., improving road, to E. J. Cerullo, Depew, $133,000; Military Rd. and Harlem Ave., to Bero Eng. & Constr. Co., Tonawanda, $25,558 and $146,332 respectively, Grand total $304,890. **P.W.A.** Bids Oct. 16. Noted Oct. 11.

North Dakota—State Hy. Comn., Bismarck, to H. L. Jensen, Kenmare, grading, graveling 0.36 mi. Ward Co., $5,847***to W. Collins, Fargo, 13.549 mi. Grand Forks Co., $34,534; 9.11 mi. Pembina Co., $18,896; 4.154 mi. Ransom Co., $6,991***to W. Coman, Goodrich; 8.3 mi. Burke and Montrail Counties, $40,327; graveling 10.539 mi. Griggs Co., $10,306; 10.248 mi. Steel Co., $10,367; 9.807 mi. Traill Co., $11,577; 9.387 mi. Cass and Richland Counties, $24,459***to A. Campbell, Warwick, 3.213 mi. Pierce Co., $441***to Wilder & Wilder, Jamestown, 5.263 mi. Stutsman Co., $6,344; 8.349 mi. in Stutsman Co., $14,802***to Cosmos Constr. Co., Cosmos, Minn., 8.834 mi. Pembina Co., $14,850***to W. H. Noel, Jamestown, 4.873 mi. McKenzie Co., $5,032; Scoria surfacing 11.138 mi. McKenzie Co., $16,504*** to Northwest Constr. Co., Bismarck, graveling 7.014 mi. Bowman Co., $9,837; 10.839 mi. Divide Co., $8,657; 9.02 mi. Kidder Co., $13,711; 8.562 mi. Stark Co., $13,839; 8.227 mi. Logan Co., $5,866; 6.872 mi. McLean Co., $11,866***to L. Sloan, Ellendale, $8,126 mi. Ward Co., $5,888***to J. A. Jardine, Fargo, structures in Grand Forks Co., $11,965***to Ray Eng. Co., Wahpeton, in Pembina Co., $3,220. Grand total $314,130. **P.W.A.** Bids Oct. 19. Noted Oct. 4 and 11.

Ohio—O. W. Merrell, dir. Hys., Columbus, concrete paving and placing wearing surface on bridge on 2.547 mi. Sect. "D" Bellefontaine-Kenton Rd., Logan Co., to L. L. Clymer, Bluffton, $68,522. Bids Oct. 20.

Ohio—O. W. Merrell, dir. Hys., Columbus, bituminous macadam on waterbound macadam paving and brick on concrete paving part of hy., 0.13 mi. Sects. "D" and "E" (part) Zanesville-New Lexington Rd., Perry Co., to Adams Constr. Co., Muskingum Ave., Zanesville, $5,800***concrete paving 3.159 mi. Sect. "A" Piqua-Urbana Rd., Champaign Co., to Hinton & Smalley, Celina, $88,239***cold laid asphaltic concrete paving 0.559 mi. Sect. "Kenton"and "F" Lima-Kenton Rd., Hardin Co., to L. L. Clymer, Bluffton, $38,005***grading, drainage structures, widening present concrete pavement, landscaping, hot laid asphaltic concrete surfacing 2.668 mi. Sects. "B" and "C" (part) Toledo-Grand Rapids Rd., Wood Co., to H. P. Streicher & O. T. LaBoiteaux, 3435 Dorr St., Toledo, $175,830. Grand total $307,874. Bids Oct. 19.

O., Cleveland—City, brick on concrete surfacing 2,246 sq.yd. Waterloo Rd. from Nottingham Rd. to East 185th St., incl. 1,290 cu.yd. excav., 950 ft. stone curbing, 700 ft. 4 in. french drain, 2,580 sq.yd. wire mesh and 5,880 sq.yd. Walworth Ave. from Fulton Rd. to West 41st St., 5,200 cu.yd. excav., 5,880 sq.yd. wire mesh, 3,200 ft. stone curbing and 3,200 ft. 4 in. french drain to Rieley Bros., 9521 Woodland Ave., $14,666 and $33,785 respectively.

O., Cleveland—Cleveland Metropolitan Park Bd., 1328 Standard Bldg., driveway in Euclid Creek Reservation, involving 8,000 cu.yd. gravel, 82,000 cu.yd. earth excav., to Newhall Herkner Constr., 5450 Hamilton Ave., $59,111. **P.W.A.** Bids Sept. 29.

Oklahoma—State Hy. Dpt., Oklahoma City, grading, drainage 6.43 mi. road in Osage Co., to Pharoah & Co., Henryette, $55,973 est. $60,000***1.25 mi. Cimarron Co., to Ellis & Lewis, 507 Surety Bldg., Muskogee, $40,534 est. $38,960***5.19 mi. McCurtain Co., to J. T. Ables, Modill, $30,796 est. $32,000***1.315 mi. Ottawa Co., to Moran & Buckner, Muskogee, $22,074 est. $25,000. Grand total $419,377. **P.W.A.** Bids Oct. 16.

Pennsylvania—At office S. S. Lewis, secy. Hys., Harrisburg, rein.-con. paving and constructing pedestrian underpass and retaining wall, 0.82 mi. Route 247, Sect. 3, Pittsburgh, Allegheny Co., to Donatelli & Donatelli, 7202 Apple St., Pittsburgh, $237,376; rein.-con. paving, bituminous surfacing Spec. "E", 0.23 mi. Route 136, Lancaster, Lancaster Co., to J. H. Swanger, Breneman Bldg., Lancaster, $15,608. **P.W.A.** Bids Oct. 5.

Pa., Warren—City, C. Barvis, city engr., bituminous concrete paving Grant St. from Pennsylvania to Madison Aves., Central Ave. and Russell St. from Pennsylvania to Madison Aves., Carter St. from Pennsylvania to Lexington Aves., Biddle St. from Main Ave. to Crescent Park, day labor under supervision city engineer. To exceed $25,000.

†**South Dakota**—Pub. Rds., Denver, Colo., grading, surfacing 5.836 mi. road in Pennington Co., to Inland Constr. Co., 3867 Leavenworth St., Omaha, Neb., $58,816. Bids Oct. 2, awarded Oct. 20. Noted Sept. 27.

Tex., Houston—City, double bituminous surface treating White Oak Drive from Milam St. to east line Acauff St., to Gulf Bitulithic Co., 2820 Polk Ave., $22,992. Est. $24,000. Noted Oct. 18.

Tex., Kilgore—City, concrete paving 57,482 sq.yd. streets, to A. C. Campbell, Shreveport, La., $138,734.

Tex., Pampa—Gray Co., c/o R. C. Wilson, aud., Pampa, rock asphalt surfacing (caliche now in place) 29 mi. roads, to O. Speer, Alvord, $231,890. Est. $235,000.

†**Utah** — Pub. Rds., Ogden, reconstructing 6.495 mi. road in Garfield Co., to Ora Bundy, Ogden, $42,695. Est. $48,041. Bids Oct. 28. Noted Sept. 20.

Virginia—State Hy. Dpt., Richmond, soiling and surfacing 5.984 mi. Charlotte Co., to Perkins-Barnes Constr. Co., Blackstone, $44,808*** paving Semmes Ave., to Atlantic Bitulithic Co., Richmond, and Munsey Bldg., Wash., D. C., $24,541***7.463 mi. Halifax and Pittsylvania Counties, to Short & Thompson, Inc., Hopewell, $11,430***4.131 mi. Warwick Co., to Luck Constr. Co., 1617 Brook Pl., Richmond, $31,151***1.051 mi. Campbell Co., to Wood & Shipley Co. and J. P. Harvey, Inc., Huntington, W. Va., $48,163***bituminous surfacing 5.75 mi. Prince Edward Co., to S. E. Finley, Roanoke, $7,957. Grand total $194,176. **P.W.A.** Bids Oct. 16 and 23. Noted Oct. 4 and 11.

Wash., Seattle—Bd. P. Wks., City Hall, widening and paving Jackson St., to J. B. Covello, 1510 Sturgis St. S., $28,248. Bids Oct. 18.

Wisconsin—State Hy. Comn., Madison, grading, draining, graveling 4.289 mi. Burnett Co., to Fitzpatrick & Kuenzli, Cumberland, $26,762; concrete paving 2.772 mi. Ozaukee Co., to F. S. Tillman, 5346 North Santa Monica Blvd., Milwaukee, $60,535. Bids Sept. 25 and Oct. 16. Noted Sept. 20 and Oct. 4.

Wis., Tomahawk—City, concrete paving roads, to L. G. Arnold Co., Eau Claire, $22,150. Bids Oct. 19.

Wyoming—State Hy. Comn., Cheyenne, grading, draining, base course surfacing and bridge on 10.632 mi. Carbon Co., to Blanchard Bros. Constr. Co., 1641 South Logan St., Denver, Colo., $57,456***base course surfacing 12.736 mi. Lincoln Co., to Green River Lumber Co., Green River, $17,312***grading 8.126 mi. Laramie Co., to J. H. and N. M. Monahan, Denver, Colo., $34,047***bridge on same road, to E. Selander, Greeley, Colo., $15,877***base course surfacing 13.675 mi. Carbon Co., to L. Landreth, Scotts Bluff, Neb., $25,832***grading 2.399 mi. Fremont Co., to Sharock & Pursel, Casper, $22,002***bridge on same road, to Rognstad & Olsen, Casper, $14,620***base course stabilization on 10.496 mi. Sweetwater Co., to Woodward Constr. Co., Rock Springs, $17,726*** crushed rock surfacing 29.992 mi. Sweetwater and Sublette Counties, to M. E. Carlson, Denver, Colo., $51,349. Grand total $256,220. **P.W.A.** Bids Oct. 23.

Ont., Barrie—Town, curbing, guttering, paving 5 blocks Elizabeth and Ross Sts., 24-27 ft., to W. C. Breanan Paving Co., Hamilton. Est $25,200.

EARTHWORK, IRRIGATION DRAINAGE AND WATERWAYS

PROPOSED WORK

Calif., Sacramento—City plans municipal harbor developments. To exceed $25,000. G. F. Nicholson, Los Angeles, consult. engr.

Calif., Winters—Yolo Co. (Woodland), plans constructing system of percolation reservoirs for conservation of water in Putah Creek, near here.

†**Ill., Chicago**—U. S. Eng., Post Office Bldg., Chicago, soon takes bids constructing 3 barges by-passes or passing places in Sag Canal, east of 104th Ave. and east of Blue Island, increasing in width from 50 to 100 ft. $825,000. P.W.A. funds granted and plans approved.

Ind., Lawrenceburg—City, H. B. Herrick, clk., plans new levees. $20,000.

†**N. Y., Fire Island**—U. S. Eng. plans survey on waterways to determine whether a breakwater should be constructed in Fire Island Inlet.

†**O., Conneaut**—U. S. Eng., Buffalo, N. Y., preparing final plans dredging deep water channel from Lake Erie to municipal dock under construction in Conneaut Harbor. $300,000. Noted Aug. 23.

O., Painesville—Comrs. Lake Co. plan stone breakwater at County Camp, east of here, $28,000; stone jetty in Lake Erie at mouth of Chagrin River, Willoughby Twp., $54,000; 6 dams in Grand River, $59,800. **Maturity in 1935.**

Pa., Lewisburg—Borough, preliminary plans nearing completion flood control project for Bull Run. W. Frick, boro engr.

Tex., Edinburg—Hidalgo Co. Water Control & Impvt. Dist. 1, plans flood water control, drainage, etc. $902,500. R.F.C. loan approved. A. Tamm, Harlingen, superv. engr.

Tex., Harlingen—Cameron Co. Water Control & Impvt. Dist. 9, soon takes bids concrete lining of canals, on 11,000 acres land in district. $106,000. P.W.A. allotment of $400,000 rescinded by request and $106,000 made available. A. Tamm, Harlingen, engr.

Tex., Mission—Hidalgo Co. Water Control & Impvt. Dist. 7, E. P. Congdon, dist. engr., bids after Jan. 1, 1935, improvements to present irrigation system, 2,250,000 sq.ft. concrete lining, 11¼ mi. 12- to 30-in. concrete pipe line. $557,000.

BIDS ASKED

Calif., San Jose—Southern Pacific R.R., 65 Market St., San Francisco, W. Kirkbride, engr., bids about Nov. 1, grading right-of-way between Alameda and Lick Station, involving 90,000 cu.yd. earthwork.

Ind., Anderson—Nov. 10, by Bd. City Comrs., constructing Sharp Ditch, incl. 1,773 cu.yd. open ditch and 100 cu.yd. 8- to 24-in. tile. P. W. Phipps, Anderson, engr.

†**Ia., Muscatine**—Nov. 31, by U. S. Eng., Rock Island, Ill., 26,000 cu.yd. levee work on Cedar River.

Louisiana—Nov. 15, by State Bd. Engineers, New Orleans, constructing Lake St. Peter Diversion Canal 48,000 ft. long in 5th Levee Dist., Tensas Parish 4 mi. south of St. Joseph, involving 152,000 cu.yd. material; Wilson Point to Elton, Slough Canal, 10,000 ft. long, in 5th Louisiana Levee Dist., 54,000 cu.yd. material in East Carroll Parish, 6 mi. north of Lake Providence; excavating 4,000 ft. drainage canal to be known as Gassoway Canal in 5th Levee Dist., 27,000 cu.yd. material in East Carroll Parish, 1 mi. below Louisiana-Arkansas State Line.

La., New Orleans—Dec. 27, by Sewerage & Water Bd., deepening and widening Orleans Outfall Canal from Drainage Station 7 to Lake Ponchartrain, Contr. 216-D; concrete lining and covering Almonaster Ave. Canal from North Roman St. to Florida Ave. Contr. 217-D. P.W.A. project.

La., New Orleans—Jan. 17, by Sewerage & Water Bd., partly lining and partly widening

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†*Federal Government.*

Earthwork, etc. (Continued)

and deepening London Outfall Canal from Station 3 to Lake Pontchartrain and lining and covering Broad St. canal from Bruxelles St. to Station 3. Contr. 224-D. P.W.A. project.

†**Montana**—Nov. 12, by U. S. Eng., Kansas City, Mo., excavating, placing drain pipe, applying liquid sealing solution, waterproof solution, mixing and placing concrete in channel bottom and walls, drainage ditches, drilling grout holes, furnishing, placing reinforcing steel mesh and bars, placing gravel and bitumen for pavement, incl. 5,300,000 cu.yd. earth excav., 5,250,000 shale excav., etc., for spillway at Fork Peck Dam. $6,000,000. Noted Oct. 4.

Nebraska—Nov. 9, by Secretary Loup River Public Power Dist., 13th St., Columbus, completing canal excavation and earthwork; incl. 3,300,000 cu.yd. excav. P.W.A. project.

†**North Carolina**—Soil Erosion Service, Wash., D. C., plans soil erosion project on 44 acres, on watershed of Reedy Fork (tributary of Haw River) in Guilford and part of Forsyth Counties, near Greensboro. $150,000. P.W.A. allotted funds. J. H. Stallings, High Point, dir.

†**O., Conesville**—Nov. 21, by U. S. Eng., 1st Natl. Bank Bldg., Zanesville, constructing Wills Creek Dam, near here.

†**O., Mansfield**—Nov. 15, by U. S. Eng., Zanesville, constructing Charles Mill Dam, on Black Fork Mohican River, near here.

†**Pa., Pittsburgh**—Nov. 5, by U. S. Eng., Pittsburgh, removing old Lock and Dam 2, Alleghany River.

†**Va., Norfolk**—Nov. 15, by U. S. Eng., Norfolk, dredging 37,600 cu.yd. from Meherrin River, N. C.

†**Washington**—Nov. 15, by U. S. Eng., Federal Office, Seattle, dredging 640,000 cu.yd. from Duwamish Waterway, $100,000; 27,500 cu.yd. from East Waterway, $10,000. Noted Oct. 4.

†**Wash., Seattle**—Nov. 15, by U. S. Eng., dredging 640,000 cu.yd. from Duwanish Waterway, and 27,600 cu.yd. from East Waterway, Seattle Harbor.

LOW BIDDERS

†**W. Va., Grafton**—U. S. Eng., Pittsburgh, Pa., Oct. 23, constructing Tygart Reservoir Dam, from Frederick Snare Corp., 114 Liberty Ave., New York, N. Y., $6,249,423. Est. $7,137,737. Noted Oct. 18.

CONTRACTS AWARDED

†**Calif., Colusa**—U. S. Eng., Sacramento, furnishing, delivering, placing 3,400 tons rip rap stone along east bank of Sacramento River just below Colusa Weir, 1.5 mi. upstream from here, to Lord & Bishop, Native Sons Bldg., Sacramento, $2.60 per ton, total $8,840. Bids Oct. 2.

†**Calif., Marysville**—U. S. Eng., Post Office Bldg., Sacramento, raising and strengthening existing levees along Feather and Yuba Rivers, near here, to Harms Bros., 5220 21st Ave., Sacramento, at 14.5c. per cu.yd., total $16,240. Est. $23,671. Bids Oct. 10.

Calif., San Diego—Harbor Comn., dredging 370,000 cu.yd. at yacht harbor on Point Loma, to Standard Dredging Co., 325 Central Bldg., Los Angeles, at 15.4c. per cu.yd. total $56,980 •••dredging 70,000 cu.yd. between Benson Lumber Co. pier and Richfield Oil Company pier, to Sparkes & McClellan, Pickwick Hotel, San Diego, at 26c. total $18,200. Bids Oct. 18, awarded Oct. 24.

†**Calif., San Rafael**—Con. Q.M., drainage ditch at Hamilton Field, to M. Rosenberg, Inc., 255 Bayshore Blvd., San Francisco, $3,263. Bids Oct. 10, awarded Oct. 23.

†**Louisiana**—U. S. Eng., New Orleans, dredging 1,260,000 cu.yd. from East Atchafalaya Basin, to Standard Dredging Co., 80 Bway., New York, N. Y., $535,122. Bids Oct. 9. Noted Oct. 4.

†**Louisiana**—U. S. Eng., 2nd Dist., constructing 115,000 cu.yd. levee in Lower Beaver Levee, to J. W. Hendrix, Alexandria, $10,051. Bids Oct. 5.

†**Md., Baltimore** — National Park Service, Wash., D. C., filling, top soiling, seeding and planting at Fort McHenry, to Ehrhardt & May, 5723 Harford Ave., $21,211.

†**Montana**—U. S. Eng., Kansas City, Mo., Schedule 2, for 2,750,000 cu.yd. overburden and shale excavation, 12,000 squares waterproofing for portion of work at north end of spillway at Fort Peck Dam, to Martin Wunderlich, Jefferson City, Mo., $1,168,120. Bids Sept. 24. Noted Sept. 6.

Nebraska — Platte Valley P. & I. Project, North Platte, constructing regulating reservoir, power canal, forebay on Sutherland Project, to P. Kiewit Sons Co., 1024 Omaha Natl. Bank Bldg., Omaha, $411,462. **P.W.A.** Bids Oct. 22. Noted Oct. 11.

New Jersey—Bd. Commerce & Navigation, State House, Trenton, dredging channel in Cedar Run Creek, Stafford Twp., Ocean Co., to Long Island Dredging & Contg. Co., 168 North Wellwood Ave., Lindenhurst, N. Y., at 16.9c. per cu.yd. Bids Oct. 15. Noted Oct. 4.

N. Y., Olean—See "Sewerage and Waste Disposal."

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†**S. C., Charleston**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing breakwater, to Simons Mayrant Co., 16 Broad St., $2,479. Bids Oct. 10. Noted Sept. 27.

†**Tex., Houston**—U. S. Eng., Galveston, dredging 3,136,500 cu.yd. from Houston Ship Channel, to Sternberg Dredging Co., Arcade Bldg., St. Louis, Mo., $545,751. Bids Oct. 10. Noted Sept. 20.

†**Utah, Ephraim**—Bureau Reclamation, Salt Lake City, constructing Hyrum-Mendon Canal, Hyrum Feeder Canal and Wellsville Canal, to J. A. Terteling & Sons, Boise, Idaho, $27,316. Bids Oct. 11, awarded Oct. 16. Noted Oct. 4.

†**West Virginia**—U. S. Eng., Coal Exch. Bldg., Huntington, dredging 59,000 cu.yd. from Ohio River below Lock 16, to American Aggregate Corp., Greenville, O., $16,520. Bids Oct. 8. Noted Sept. 13.

N. B., Mallocks Beach—Dpt. P. Wks., Ottawa, Ont., constructing breakwater, to J. Wilson & W. G. de Wolfe, St. Stephens, $19,958.

Que., Quebec—Dpt. Marine, Ottawa, Ont., reconstructing Sheds 25 and 26, on Pier 1, St. Charles River Breakwater, involving 30,000 bags portland cement and 650 tons steel, to Delphee Maranda, Quebec. Est. $463,000.

UNCLASSIFIED

PROPOSED WORK

Calif., Chico—SWIMMING POOL—See "Public Buildings."

Ind., Linton—GAS MAINS—City plans constructing 7 mi. gas mains. $83,000. P.W.A. project.

Mass., Boston—SWIMMING POOL—City, Park Dpt., 33 Beacon St., plans concrete swimming pool and appurtenances at Franklin Park. Will probably exceed $25,000.

†**Mass., South Boston**—DOCK—U. S. Eng., Custom House, Boston, plans repairing army base pier. P.W.A. considering application by War Dpt. for allocation $961,000 for same.

Mont., Havre—GAS SYSTEM—Defeated $80,000 bonds for natural gas system. W. White, city clk. Noted Oct. 11.

Nebraska—PARK—City Council and Chamber of Commerce, Omaha, arranging to get appropriation from Congress for 25,000 acre national park known as Lewis and Clark National Park along west bank Missouri River between Homer and Decatur, incl. buildings, grading, road building, bridges, extensive fences, and other improvements. $1,000,000.

N. Y., Brooklyn—COAL POCKET—Momrow Coal & Coke Co., 324 50th St., Brooklyn, plans coal pocket. $28,000.

N. Y., Brooklyn—COMFORT STATION—Park Dpt., Arsenal Bldg., Central Park, New York, plans by A. Embury, 64th St. and 5th Ave., New York, 1 story, brick, 5th Ave. from 66th to 67th Sts. $28,000.

N. Y., Buffalo — COAL TRESTLE — See "Bridges and Grade Crossings."

N. Y., Buffalo—SWIMMING POOLS—City, G. J. Summers, comr., City Hall, constructing 3 swimming, wading and diving pools, in Cazenovia Park and remodeling Park Casino, incl. installation of chlorination pumps, underwater floodlighting systems, etc. $110,000. **Maturity soon.**

N. Y., New York—RECREATION BUILDING, etc.—Dpt. Parks, Arsenal Bldg., Central Park, plans by A. Embury, c/o owner, 1 story, stone, concrete recreation building and shelter, Fort Washington Ave. opposite 184th St. $60,000.

N. Y., Rockaway—COMFORT STATIONS—Dpt. Parks, Arsenal Bldg., Central Park, New York, plans by A. Embury, c/o owner, 40x40 ft. comfort stations, Boardwalk, and Beach 34 and 44th and 54th Sts. To exceed $28,000.

N. C., Shelby—LIGHTING SYSTEM—Cleveland Co., J. E. Blanton, chn., retained Michael & Bivens, Inc., engrs., Gastonia, to make surveys for extending rural lighting system for several miles.

O., Bellefontaine—RACE TRACK, etc.—Bellefontaine Racing Club., c/o P. J. Reichart, archt., 3513 East 110th St., Cleveland, sketches 2 story, concrete, steel frame race track and grandstand. $40,000.

Tenn., Chattanooga—RADIO STATION—Smith Broadcasting Co., 9th and Chestnut Sts., M. D. Smith, Jr., filed petition with Federal Communication Comn., to construct and operate radio station. $80,000 incl. equipment.

Texas — RECONDITIONING TRACKAGE — Waco, Beaumont, Trinity & Sabine Ry. Co., P. G. Burns, ch. engr., Rusk Bldg., Houston, plans reconditioning trackage between Weldon and Livingston, and between Trinity and Corrigan, materials consist of rock, sand and cement, will be used and likely purchased in open market by competitive bidding. Est. $260,000. Interstate Commerce Comn. approving loan from P.W.A.

Man., Winnipeg — TRANSMISSION LINE — Vanson Manitoba Mines Ltd. plans replacing steam equipment with electrical machinery and construct 60,000 volt transmission line.

Ontario — SPUR TRACK — Minefinders Ltd., Kapuskasing, soon takes bids 7 mi. standard gage spur track laid with 80 lb. rails from Smoky Falls to General Refractory Products properties.

Sask., Regina—BROADCASTING STATION—H. Charlesworth, chn. Canadian Radio Comn., Ottawa, Ont., preparing plans constructing high powered broadcasting station. $200,000.

BIDS ASKED

Calif., San Jose — RIGHT-OF-WAY — See "Earthwork, Irrigation, Drainage and Waterways."

La., New Orleans—LIGHTING SYSTEM—Nov. 22, by Public Belt R.R. Comn., furnishing all labor and material to complete details, test and put into operation the lighting system on Huey P. Long Bridge across Mississippi River. Private plans.

La., New Orleans—UNDERGROUND POWER CABLE—See "Sewerage and Waste Disposal."

N. Y., Brooklyn — SWIMMING POOL — See "Contracts Awarded."

N. Y., New York—SWIMMING POOL—See "Contracts Awarded."

Pa., Phila.—HIGH SPEED LINE EQUIPMENT BUILDINGS—Nov. 9, by Delaware River Joint Comn., at office of J. K. Costello, secy., Joint Comn., Administration Bldg., Bridge Plaza, Camden, N. J., for Contr. 7A, building in Philadelphia to house sub-station equipment for high speed rail transit line; Contr. 7B, for another building in Camden, N. J.

†**T. H., Pearl Harbor**—HANGAR—Nov. 14, by Yards & Docks, Navy Dpt., Wash., D. C., seaplane hangar at Naval Air Fleet Base, Spec. 7770.

CONTRACTS AWARDED

†**Calif., San Pedro** — MOORING — Yards & Docks, Navy Dpt., Wash., D. C., repairing mooring at Los Angeles Harbor, to Hull, Small & Ramage, Wilmington, Calif., $1,470.

†**Maine**—DISTRIBUTION SYSTEM—National Park Service, Dpt. Interior, Wash., D. C., furnishing generating unit at Radio Station, Schoodic Point, to A. Wilson & Co., 136 Liberty St., New York, N. Y., $11,989; furnishing, installing main switchboard and feeders, to New England Machine & Electric Co., 77 Bagley St., Pawtucket, R. I., $1,887. Bids Oct. 4, awarded Oct. 22.

Minn., Rochester — ELECTRIC DISTRIBUTION SYSTEM—City, underground electric distribution system from city light plant to 4th St. S.E., in alley east of Bway., to L. A. Keep Electric Co., Rochester, $39,868. Bids Oct. 12.

New York—VENTILATION EQUIPMENT—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, ventilation equipment Line A from High and Court Sts. to Rockaway Ave. and Line B from 6th Ave. to Fulton St., to Peelle Co., Stewart and Flushing Aves., Brooklyn, $328,000. **P.W.A.** Bids Sept. 28. Noted Sept. 13.

N. Y., Brooklyn—COAL POCKET—Bush Terminal Co., 451 1st Ave., coal pocket, concrete, 47th St. and 1st Ave., to Nicholson Co., 405 Lexington Ave., New York. Est. $28,000. Noted Oct. 18.

N. Y., Brooklyn—COAL POCKET—Roosevelt Coal Corp., 215 43rd St., 30x100 ft. coal pocket, concrete, Smith and Mill Sts., to Nicholson Co., 405 Lexington Ave., New York. Est. $28,000. Noted Oct. 18.

N. Y., Brooklyn—SWIMMING POOL—Dpt. Parks, Arsenal Bldg., Central Park, New York, concrete swimming pool, McCarren Park, day labor. Est. about $40,000. A. Embury, c/o owner, archt.

N. Y., Flushing—COAL HANDLING and POCKETS—Fleer Bros., 218 Tompkins Ave., Brooklyn, coal handling and pockets, to Equity Equipment Corp., c/o owner. Est. $28,000. Noted Oct. 25.

N. Y., New York—SWIMMING POOL—Dpt. Parks, Arsenal Bldg., Central Park, concrete swimming pool, Thomas Jefferson Park, day labor. $30,000 or more. A. Embury, c/o owner, archt. Noted Aug. 2.

North Carolina—ELECTRICAL WORK—State Hy. and P. Wks., Raleigh, electrical work at prison camp, near Rosman, Transylvania Co., to Martin Electric Co., Waynesville, $1,275. Noted Oct. 18.

†**T. H., Pearl Harbor**—SPRINKLER SYSTEM—Yards & Docks, Navy Dpt., Wash., D. C., sprinkler system for storehouse extension, Spec. 7704, to Grinnel Co. of Pacific, 520 Mateo St., Los Angeles, Calif., $5,081.

MATERIALS AND EQUIPMENT

PROPOSED WORK

TRACTOR—Hastings, Minn.—Dakota Co. rejected bids Oct. 12, furnishing one crawler-type gas tractor, 75 hp. J. Swan, co. hy. engr. Noted Oct. 4 Daily.

TRUCKS—Minneapolis, Minn.—City, F. S. Gram, city purch. agt, rejected bids Sept. 18 5 to 10 dump-body trucks for City Engineering Dpt. Will readvertise. Noted Sept. 13 Daily.

TANK—St. Louis, Mo.—J. C. Brendell, 1373 Union Blvd., applied for permit to install two 1,000 gal. underground steel tanks for gasoline for automobile service station, 3317 North Union Blvd.

†*Federal Government*

Materials, etc. (Continued)

TRUCKS, etc.—**Omaha, Neb.**—City Council soon takes bids for purchase of 3 trucks for Public Impvt. Dpt., and 20 passenger cars.

FIRE FIGHTING APPARATUS—**Jamestown, N. Y.**—City, J. Midgley, clk., plans purchasing new motor driven aerial truck, $6,000 or more. L. F. Graham, city engr.

BIDS ASKED

CABLE—**Los Angeles, Calif.**—Nov. 14, by D. P. Nicklin, purch. agt, Dept. Water & Power, 207 South Bway., furnishing, delivering f.o.b. 1630 North Main St., 3,850 ft. 49 conductor, rubber-insulated, lead-covered cable, consisting of 4 conductors of 7 strands No. 6 AWG; 39 conductors of 19 strands No. 25 AWG; 3 twisted pairs of No. 16 AWG wire; alternate 3,350 ft. cable as above and 500 ft. 25 conductor, rubber-insulated lead covered cable, consisting of 4 conductors of 7 strands No. 16 AWG; 19 conductors of 19 strand No. 25 AWG; 1 twisted pair No. 16 AWG wire, Spec. 1519; furnishing, delivering transmission line, hardware, overhead, 6,372 clevis fittings rod connection, angle or standard suspension, 1,407 clevis fittings, plate connection, angle or standard suspension; 7,530 upper arcing horns, standard suspension insulators, 249 upper arcing horns, angle suspension insulators, 7,779 lower arcing horns, angle and standard suspension insulators, 2,112 each upper and lower arcing horns, strain insulators, 2,112 each upper and lower strain yokes, 2,112 right angle double clevis strain insulators, 2,112 extension links strain insulators, Spec. 1545, f.o.b. any transcontinental railroad point in California or Nevada for use on Boulder Dam power transmission line.

CEMENT—**Los Angeles, Calif.**—Metropolitan Water Dist., 306 West 3rd St., authorized F. E. Weymouth, ch. engr. and genl. mgr., to advertise for bids for 5,000,000 bbl. cement, a sufficient quantity for all the concrete work in connection with Colorado River Aqueduct project.

GATE VALVES—**San Francisco, Calif.**—Nov. 16, by T. A. Brooks, city purch. agt., City Hall, 30 in., 36 in., 42 in. and 48 in. hydraulic motor operated and manually operated gate valves, Bid 1284, under P.W.A. Provisions.

†MOTOR GENERATOR SETS—**Wash., D. C.**—Nov. 20, by Treas. Dpt. at office Sup. Archt., Wash., D. C., extending motor generator sets, etc., to federal warehouse.

TREATED TIMBER—**Florida**—Nov. 8, by State Road Dpt., Tallahassee, 42,95 M.F.B.M. treated timber 16 lb. treatment, 7,030 lin.ft. treated piling, 221 lb. treatment, and approximately 4,748 lin.ft. untreated piling, long leaf yellow pine, 85% heart, f.o.b. cars St. Augustine.

FIRE HOSE—**Morris, Ill.**—Nov. 12, by City, furnishing, delivering 2,000 ft. 2½ in. standard fire hose. M. H. Fread, city engr.

TRUCK PARTS, etc.—**Indiana**—Nov. 8, by J. D. Adams, chn. State Hy. Comn., Indianapolis, truck parts and 1 fume hood, incl. hot plate for chemical laboratory, f.o.b. Indianapolis; 150-200 tons 2, 3 and 7 crushed aggregate, f.o.b. Warsaw; 120-240 tons powdered asphalt, f.o.b. LaPorte, Fort Wayne, Seymour, Vincennes, Greenfield, and Crawfordsville; wood guide posts, f.o.b. Richmond; 800 wood guide posts, f.o.b. Bluffton.

CABLE—**New Orleans, La.**—See "Sewerage and Waste Disposal.

PIPE, etc.—**Hector, Minn.**—Nov. 8, by Village, O. Melberg, recdr., 2,000 lin.ft. 4 in. Class B c.i. mains, 4 hydrants, two 4 in. hub end valves and 2 valve boxes, six 4 in. water-main tees, four 4 in. plugs, 1,000 lb. pig lead.

TELEPHONE and EMERGENCY EQUIPMENT—**New York**—Nov. 16, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., New York, furnishing, installing telephone and emergency alarm equipment for portion of Independent City-owned Rapid Transit R. R.; also furnishing, installing station and tunnel lighting equipment, electric heating for part of City-owned Rapid Transit Railroad between and adjacent to Court St. and Rockaway Ave. Stations, inclusive.

LUMBER—**Albany, N. Y.**—Nov. 7, by Dpt. P. Wks., Div. Hys., 520 ft. untreated and 40 pcs. treated lumber delivered at Poughkeepsie; 3,995 pcs. treated and 194 pcs. untreated lumber delivered at Montgomery; 100 pcs. treated and 209 pcs. untreated at Martindale; and 210 pcs. rough dressed timber at Chatham Center.

TRENCH CABLE—**Raleigh, N. C.**—Nov. 8, by Div. Purchase & Contr., A. S. Brower, dir., 5,500 lin.ft. trench cable. Est. about $2,500.

†DERRICK BOAT—**Cleveland, O.**—Nov. 21, by U. S. Eng., Federal Bldg., Buffalo, N. Y., one 25 ton whirler derrick boat.

TRUCK—**Sturgis, S. D.**—Nov. 14, by Meade Co., S. C., Voorhees, aud., one 1½ ton truck.

†PENSTOCK TRASHRACK METAL WORK—**Knoxville, Tenn.**—Nov. 13, by Tennessee Valley Authority, Knoxville, furnishing, fabricating, shop painting, and delivering penstock trashrack metal work for Wheeler Power Plant, incl. structural steel guides, plates, trashrack bars, guide bars. C. H. Garrity, dir. Purchases.

†CRIB FILLING—**Huntington, W. Va.**—Nov. 6, by U. S. Eng., crib filling for U. S. Lock 4, Little Kanawha River, involving 1,200 tons coarse gravel, boulder and stone, ranging from 2- to 12- in.; and 1,800 tons rough stone in pieces from 50 to 1,000 lb.

†LUMBER—**Huntington, W. Va.**—Nov. 7, by U. S. Eng., lumber for U. S. Locks 8 and 10, Kanawha River and U. S. Lock 16, Ohio River.

†PIKES POLES, etc.—**Huntington, W. Va.**—Nov. 6, by U. S. Eng., pike poles, straight pike and hooks, axe and hammer handles, skiff oars at various locks on Ohio, Kanawha, Little Kanawha and Tug Fork Rivers.

†WINCHES—**Summit, C. Z.**—Nov. 28, by Yards & Docks, Navy Dpt., Wash., D. C., motor and hand operated winches for antennas, Spec. 7800.

†WINCHES—**Pearl Harbor, T. H.**—Nov. 28, by Yards & Docks, Navy Dpt., Wash., D. C., winches for antennas Naval Radio Station, Spec. 7801.

CONTRACTS AWARDED

TRANSFORMERS — **Alameda, Calif.** — City, Bd. P. Utilities, three 250 kva. transformers, to Westinghouse Electric & Mfg. Co., 1 Montgomery St., San Francisco, $4,109. Awarded Oct. 17.

SEWER MATERIALS—**Gustine, Calif.**—City Council, W. L. Chappell, clk., furnishing materials and constructing industrial sewer, consisting 2,444 ft. 18 in. and 724 ft. 14 in. concrete irrigation pipe, manholes, etc., to United Concrete Pipe Corp., Ceres Hy., Modesto, $2,668. Awarded Oct. 15. Noted Oct. 11.

AGGREGATE WEIGH-BATCHER—**Los Angeles, Calif.**—S. A. Joseph, purch. agt. Metropolitan Water Dist., 306 West 3rd St., 1 aggregate weigh-batcher complete, Spec. E-132. 1 cement weigh-batcher, in accordance with Spec. E-125, revised, Bid 28477, to Smith-Booth-Usher Co., 2001 Santa Fe Ave., $4,520. Bids Oct. 12, awarded Oct. 22.

CHARGING and MIXING EQUIPMENT—**Los Angeles, Calif.**—Metropolitan Water Dist., 307 West 3rd St., F. E. Weymouth, engr., equipment for charging, mixing and placing concrete for lining 16 ft. tunnel, Spec. 73, Colorado River Aqueduct, to Brown-Bevis Mchy. Co., 4900 Santa Fe St., $15,400. Bids Sept. 25.

DISTRIBUTION TRANSFORMERS—**Los Angeles, Calif.**—D. P. Nicklin, purch. agt. Dpt. Water & Power, 207 South Bway., distribution transformers as follows: ten 25 kva. and three 37½ kya. pole type, 4600/230/115 V. class 200; and four 200 kva. subway type, 4600-230/115 V, class 200, Spec. 1501, to Maloney Electric Co., I. W. Hellman Bldg., $6,827. Bids Sept. 27, awarded Oct. 23.

POLES—**Los Angeles, Calif.**—Flood Control Dist., 205 South Bway., S. M. Fisher, engr., 4,000 untreated D.F. poles, 28 to 32 ft. long, butt end 12 in., tip end 8 in., to J. H. Baxter Lumber Co., 601 West 5th St., $14,550. Bids Oct. 8, awarded Oct. 19.

CAST IRON PIPE—**Oakland, Calif.**—J. H. Kimball, secy. East Bay Municipal Utility Dist., 512 16th St., 55,000 lin.ft. 4- to 8-in. c.i. pipe, and 10,000 ft. 4 and 6 in. c.i. pipe, Spec. LS-131, to National Cast Iron Pipe Co., 571 Mission St., San Francisco, $26,550 and $5,625 respectively. Bids Oct. 10, awarded Oct. 23.

MOTOR TRUCK CHASSIS—**Oakland, Calif.**—J. H. Kimball, secy. East Bay Municipal Utility Dist., 512 16th St., 25,000 lb. motor truck chassis, Proposal 558, to Fageol Truck & Coach Co., Hollywood and 107th Ave., Oakland, $3,256 net. Bids Oct. 10, awarded Oct. 23.

†MOTOR GENERATOR SET, etc.—**San Diego, Calif.**—Yards & Docks, Navy Dpt., Wash., D. C., motor generator set, etc., Spec. 7810, to E. C. Nickel, 912 Micheltorena St., Los Angeles, $9,786.

PUMPING UNIT—**San Francisco, Calif.**—T. A. Brooks, city purch. agt., 2 direct-connected motor-driven pumping units, centrifugal pumps preferred, Bid 1265, to Westco Pump Sales Co., 951 Folsom St., $491. Bids Sept. 21.

RUBBER INSULATED CABLE—**Chicago, Ill.**—Dpt. P. Wks., City Hall, furnishing, delivering 75,000 ft. No. 1 rubber insulated lead sheathed cable, to General Electric Co., 230 South Clark St., $6,203; 2,800 ft. No. 8 rubber insulated lead sheathed, 5,000 volt 12 conductor cable, to American Steel & Wire Co., Illinois Continental Bank Bldg., $2,833. Awarded Oct. 23.

SEWER BRICK — **Minneapolis, Minn.** — City, F. S. Gram, purch. agt., 79,000 sewer brick for manhole work, to Landers-Morrison-Christensen Co., 800 Builders Exch. Bldg., $15.10 per 1,000 delivered on job; 122,000 bd. ft. rough pine lumber, various sizes, one carload each, to Streator Lumber Co., 1001 Lumber Exch., and to G. M. Stewart Lumber Co., 421 Northeast Johnson St., at $32 per 1,000 for 2x8 ft., 16 ft. long. Bids Oct. 10.

†STEEL PONTOONS, etc.—**St. Louis, Mo.**—U. S. Eng., 10 full deck steel pontoons, afloat, to Ingalls Iron Wks. Co., 720 4th Ave. S., Birmingham, Ala., $25.150•••12 sections (600 lin.ft.) 34 in. discharge pipe, etc., to Treadwell Constr. Co., Midland, Pa., $6,840, Bids Oct. 6 •••200,000 ft. mattress lumber, f.o.b. U. S. Barge at Cul-de-Sac on Missouri River, to W. P. Brown & Sons Lumber Co., 2531 South 4th St., Louisville, Ky., at $28 per 1,000 ft., Bids Oct. 10••••6,000 cu.yd. stone and 1,000 cu.yd. crushed stone for use on Mississippi River also 3,000 cu.yd. stone and 1,500 cu.yd. spalls for use in Missouri River, to Hafner Rock & Constr. Co., Tebbetts, $1.75 also $1.75 and $1.70 per cu.yd. respectively•••4,000 cu.yd. stone and 1,500 cu.yd. spalls for Missouri River, to Bussen Quarries, Inc., Jefferson Barracks, $1.75•••49,000 lin.ft. in about 1,000 sticks of piling, to W. T. Ferguson Lumber Co., Arcade Bldg., 17.5c. and 20c. per lin.ft.

†CEMENT—**Montana** — U. S. Eng., Kansas City, Mo., 300,000 bbl. portland cement in bulk and 35,000 bbl. in paper bags, for Fort Peck Dam, to Three Forks Portland Cement Co., Denver, Colo., at $1.65 and $1.85 per bbl. respectively, f.o.b. Trident, 10c. per bbl. Montana discount, $559,750•••300,000 bbl. cement, to Universal Atlas Cement Co., 208 South LaSalle St., Chicago, Ill., $1.2452 per bbl. f.o.b. mill, bulk, 10c. per bbl. discount, $373,500. Bids Oct. 16. Noted Oct. 4.

†RIP RAP STONE—**Bellevue, Neb.**—U. S. Eng., City Natl. Bank Bldg., 5,200 cu.yd. rip rap stone, f.o.b. on barge at Bellevue, to Everett Pickens, Plattsmouth, $11,076. Bids Oct. 8.

†CRIB POLES, etc.—**Omaha, Neb.**—U. S. Eng., Natl. City Bank Bldg., 130 crib poles not less than 8 in. diam. at butt and not less than 4 in. diam. elsewhere, f.o.b. material yard, at Bellevue, to W. Jones, 989 Omaha Natl. Bank Bldg., at 32c. each. Bids Oct. 4; gasoline tractor, f.o.b. Peoria, to Caterpillar Tractor Co., Peoria, Ill., $2,490. Bids Oct. 8.

†CEMENT—**Boulder City, Nev.**—Bureau Reclamation, Denver, Colo., 250,000 bbl. cement for Boulder Dam, to Union Portland Cement Co., Ogden, Utah, $1.2644 per bbl., f.o.b. mill.

†TURBINES—**Knoxville, Tenn.**—Tennessee Valley Authority, 2 turbines for Norris Dam, to Newport News Shipbuilding & Dry Dock Co., 90 Broad St., New York, $467,000•••1 turbine, to Baldwin Southwark Machine Co. (affiliate of Baldwin Locomotive Co.), Chester Park and Simpson Sts., Eddystone, Phila., Pa., $333,000 Bids Oct. 8. Noted Sept. 6.

MUD SHELL — **Galveston, Tex.** — Galveston Co., c/o I. Predecki, aud., 19,000 tons mudshell, incl. delivery of mudshell f.o.b. cars on chute at Galveston, 5,000 tons, to W. D. Haden & Co., 319 21st St., Galveston; 5,000 tons, to John Young Co., Inc., N.S.N. Bank Bldg., Galveston, 9,000 tons, to W. A. Kelso Building & Material Co., Dickinson, all at $1.15 per cu.yd.

FOREIGN

China, Hangchow—Government preparing plans and takes bids this year constructing bridge over Chientang River, near here. $2,500,000.

England, Bloomsbury—London Co. Council, City of London, and City Companies voted $3,110,000 for erecting ceremonial hall in connection with University of London.

England, Corby—Stewarts & Lloyds Ltd., preparing plans constructing 300 houses, $1,500 each. Bids in November.

England, London—Plans under review by Ministry of Transport for constructing tunnel under Thames River between Dartford and Purfleet, $15,000,000; bridge over Humber, at Hull, $10,000,000; tunnel under River Tyne at Newcastle, $10,000,000. **Maturity this year.**

England, Purfleet—Thames Board Mills Ltd. preparing plans constructing 2 machine mill, $650,000.

Germany—German Government, Berlin, Ministry of National Economy, plans constructing lignite plant for synthetic gasoline, in central part Lignite Coal Dist. 250,000,000 reichsmarks.

Italy, Suivania—Italian Government, Rome, plans constructing dam to impound 47,000,000 cu. meters of water and hydro-electric plant to supply current to Italian Railway System. To exceed $1,000,000.

Mexico—Government of Mexico, Ministry of Transportation, Mexico City, plans constructing 450 mi. new railroad from Santa Lucrecia to Campeche, $5,000,000; Mexican National Railways plans expending $3,236,000 for substituting standard gage on line between Mexico City and Vera Cruz.

North Ireland, Belfast—City Council bids in December, constructing mental hospital at Purdysbern, $500,000.

Scotland—Glasgow City Council plans constructing 61,700 houses in 5 year programme, $1,625 each, total approximately $100,000,000 •••**Edinburgh** City Council takes bids in November 250 houses, $2,675,000.

South Africa, Johannesburg—T. H. Watermeyer, chn. South African Railways & Harbors Administration, takes bids this year locomotives $2,217,500; coaches $1,337,075; and freight wagons $3,333,820.

Union Socialist Soviet Republics—Commissariat of Heavy Industry, Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., New York, plans additions to Engles machine building plant, $2,000,000.

Union Socialist Soviet Republics—Commissariat of Heavy Industry, Moscow, and c/o Amtorg Trading Corp., 261 5th Ave., New York, steel plant in Khalilovo, Middle Volga Region, by day labor. To exceed $1,000,000.

Union Socialist Soviet Republics—Commissariat of Heavy Industry, Moscow, and c/o Amtorg Trading Corp., 261 5th Ave., New York, plans working gypsum deposits along North Dirna River, also constructing alabaster and cement plants. **Maturity in 1935.** To exceed $1,000,000.

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†*Federal Government.*

Foreign (Continued)

Union Socialist Soviet Republics—Dpt. Mining, Commissariat of Heavy Industry, Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., New York, developing molybdenum ore deposits in western part of Gergia by day labor. To exceed $600,000. **Maturity later.**

Union Socialist Soviet Republics—Oil Trust, c/o Soviet Government, Moscow, or c/o Amtorg Trading Corp., 261 5th Ave., New York, plans developing oil deposits near Ufa, in Bashkir Republic. To exceed $5,000,000. **Maturity indefinite.**

PUBLIC BUILDINGS

PROPOSED WORK

Ariz., Tempe—Arizona State Teachers College, G. Gammage, pres., plans by Lesher & Mahoney, 1100 Title & Trust Bldg., Phoenix, dormitory, library addition, students activities building and stadium. $455,000. P.W.A. project.

Calif., Chico—State plans by G. B. McDougall, state archt., P. Wks. Bldg., Sacramento, rein.-con. men's gymnasium and outside swimming pool at State Normal School Grounds. $115,000 or more.

Calif., Los Angeles—Bd. Educ. plans by H. C. Deckbar, 2117 South La Salle Ave., new building, replacement at 49th St. School, 4917 McKinley Ave. $107,514. H. A. Nelson, 2117 South La Salle Ave., engr.

Calif., Los Angeles—Los Angeles Bd. Educ. working drawings by A. C. Martin, 228 Higgins Bldg., approved for auditorium and annex only, for rehabilitating, strengthening, reconstructing at Polytechnic High School, 400 West Washington St. $107,000. Holmes & Narver, 639 South Spring St., structural engrs. Noted Feb. 22.

Calif., San Luis Obispo—Supervs. San Luis Obispo Co. plans by Walker & Eisen, 708 Pacific Commerce Bldg., Los Angeles, 3 story, basement, 118x181 ft., rein.-con. frame, brick filler walls, hollow terra cotta tile county building, incl. hall of records, storage rooms, county welfare department in the basement, supervisors offices, assessors, tax collectors, auditors, county clerks offices, court rooms, etc., and jail to accommodate 48 prisoners. $380,000.

†Ill., Chicago—Federal Housing Bd., Dpt. Interior, Wash., D. C., plans removing existing buildings, constructing 2,000 residences, necessary service and social buildings, on site in negro community, South Parkway, Cottage Grove Ave., 35th and 37th Sts. $7,000,000, incl. acquisition of site. W. H. Dresser, Federal Court House, Chicago, in charge. Architect and engineer not appointed.

Ind., Indianapolis—School Comn., A. B. Good, dir., 150 North Meridian, plans by Vonnegut-Bohn & Mueller, 610 Indiana Trust Bldg., 2 story, basement, brick, steel high school addition to Broad Ripple School. East 63rd St. $150,000.

Ind., Lawrenceburg—School Comrs., J. W. Riddle, supt. Schools, plans high school. $150,000. Architect not appointed.

Mass., Barnstable—Barnstable County Court House, Court House, plant brick, concrete, structural steel house of correction, near county court house. $160,000. Architect not appointed.

Mass., Franklin—Town, R. Sewell, chn. Building Comn., Town Hall, plans Junior High School. To exceed $150,000. **Maturity indefinite.** Architect not appointed.

Mass., Salisbury—Commonwealth of Massachusetts, P. Wks. Dpt., 100 Nashua St., Boston, plans by A. Suck, 94 Arlington St., Hyde Park, constructing 5 piers and 20 or more warehouses, also dredging to provide deeper traffic channel, Salisbury Beach. To exceed $100,000.

Mo., Poplar Bluff—City, W. A. Sanner, mayor, soon takes bids rein.-con., brick, stone city hall, library and community auditorium. $148,009 allotted by P.W.A. Pleitch & Price, Arcade Bldg., St. Louis, archts.

Mont., Bozeman—Gallatin Co., c/o I. W. Bigelow, clk., election Nov. 6, $185,000, for 3 story, basement, brick, steel, court house. $300,000. $30,000 allotted by P.W.A. F. Willson, Bozeman, archt. Noted Feb. 22.

N. J., Morristown—Town plans by C. E. Patterson, 3801 Navy Dpt. Bldg., Wash., D. C., and John Russell Pope, consult. archt., 542 5th Ave., New York, 3 story, basement, brick, steel library and museum. $180,000.

N. J., Rutherford—Bd. Educ., 54 Elliot Pl., plans Senior High School addition. $100,000 or more. Architect not appointed.

N. Y., Auburn — City, W. B. Patterson, mgr., soon takes bids electric light and power plant, incl. diesel generators, also street lighting system. Burns & McDonnell Eng. Co., 107 West Linwood Blvd., Kansas City, Mo., engrs.

N. Y., Howard Beach—Bd. Educ., 500 Park Ave., New York, plans by W. C. Martin, Flatbush Ave. and Concord St., Brooklyn, constructing P. S. 146, Queens, 159th Ave. and 98th St. $386,000. P.W.A. funds allotted.

N. Y., Hudson—City sketches completed by Tooker & Marsh, 101 Park Ave., New York, school. $540,000. P.W.A. project.

N. Y., Hunter—Bd. Educ., elementary and junior high school. Bids exceeded estimates and appropriation, indefinite whether owner will secure increased appropriation or whether project will be revised and readvertised. Noted Sept. 27.

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N. Y., Jackson Heights—Bd. Educ., 500 Park Ave., New York, soon takes bids constructing P. S. 149, Queens, 34th Ave. and 93rd St. $565,000. W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn., archt. P.W.A. funds allotted.

N. Y., Marlboro—Central School Dist. plans grade and high school. $350,000. Architect not appointed.

N. Y., Schroon Lake—Central School Bd. soon takes new bids 2 story, basement, brick, steel central grade and high school, plain found. $220,000. C. W. Clark, Cortland, archt. P.W.A project. Former bids rejected. Noted Apr. 5.

N. Y., Syracuse—Bd. Supervs. Onondaga Co. plans by Randall & Vedder, S. A. & K. Bldg., nurses home, on Onondaga Hill, near here. $215,000. O. S. Cane, co. purch. agent, will probably buy all materials. TERA funds pay for all labor. Noted Sept. 20.

O., Tiffin—City plans new city hall, $118,755. Made application to FERA for $48,463 allotment. Will vote on $50,000 bond issue Nov. 6, to defray part of cost of proposed structure.

Ore., LaGrande—State soon takes bids 2 story, basement, brick, steel training school with gymnasium, plain found., at Normal School, School Grounds. $130,000. J. V. Bernis, Lewis Bldg., Portland, archt. Noted Aug. 23.

Pa., Oakmont—School Bd. Penn Twp., plans brick, steel high school, near here. $250,000. J. H. Phillips, Wabash Bldg., Pittsburgh, archt. C. C. Dunnells, Century Bldg., Pittsburgh, engr. Plans application for P.W.A. aid.

Pa., Pittsburgh—City plans by R. Neff, City County Bldg., 2 wing addition to hospital, addition to utility building and new building for female inmates, Mayview St. $547,000. City Council ordinance authorizing bond issue.

Pa., Pittsburgh—Bd. Comrs. Allegheny Co., plans by Ingham & Boyd, Empire Bldg., brick, steel juvenile detention home, Halket St. and Blvd. of Allies. $350,000. P.W.A. project. Noted Aug. 9.

R. I., Providence—City, F. S. Nolan, comr. P. Wks., plans central fire station. To exceed $150,000. I. S. Gorman, city engr., City Hall.

Tenn., Nashville—City, City Administration Bldg., plans market house on site just east of City Square. Election Dec. 27. $400,000 bond issue. Architect not appointed.

Tenn., Nashville—Davidson Co., plans court house and jail, City Sq. Made application to P.W.A. for $2,000,000 loan and grant.

†Tex., Fort Sam Houston—Con. Q.M., Fort Sam Houston, plans constructing heating plant, repairing garage, telephone line, and installation, also barracks for 200 medical detachment, noncommissioner officers quarters and nurses quarters. $750,000; constructing 3-4 story, basement general hospital, $1,250,000.

Tex., Henderson — Henderson Independent School Dist., c/o C. O. Pollard, secy., bids after Nov. 1, 3 story, 100x185 ft., brick, rein.-con. hollow tile high school, plain and caisson found., incl. 21 classrooms, auditorium, cafeteria, offices, vocational shops. $154,600. E. F. Neild, City Natl. Bank Bldg., Shreveport, La., and J. A. Carraras, Henderson, archts. Noted July 26.

Tex., Kingsville—Texas College of Industrial Arts, R. L. Bobbitt, pres., bids in November, 2 story, semi-fireproof dormitory buildings, brick, concrete, construction, plain found. $300,000. P.W.A. project. Phelps & DeWees, Gunter Bldg., and J. Marriott, Frost Bldg., San Antonio, archts. Matthews & Kenan, and L. D. Royer, Smith Young Tower Bldg., San Antonio, engrs. Noted July 26.

†Tex., San Antonio—U. S. Eng., Kelly Field, plans buildings for personnel, shops, warehouses, hangars, at Kelly Field. $5,500,000. P.W.A. funds allotted.

†Tex., San Antonio—U. S. Eng., Brooks Field, plans building for housing personnel, shops, and hangars at Brooks Field. $3,800,000 funds allotted by P.W.A.

†Tex., San Antonio—U. S. Eng., Duncan Field, plans shops, for rebuilding airplanes, warehouses, housing, garages, etc., at Duncan Field. $1,800,000. P.W.A. funds allotted.

Tex., San Marcos — Southwestern Teachers College, c/o C. E. Evans, San Marcos, plans by W. E. Ketchum, 209 East Milton St., Austin, girls dormitory. P.W.A. approved $126,000 allotment. Noted Feb. 15.

Va., Danville—City plans constructing new high school, school for negros, altering existing schools. $250,000. City approved bond issue.

Ont., Galt—Dpt. P. Wks., Ottawa, plans by J. Evans, Galt, post office. $160,000. Site purchased.

Ont., Toronto—City plans by C. E. Dyson. Bd. Educ., 155 College St., new high school in North Toronto. $392,000.

BIDS ASKED

†Calif., Earp—Nov. 9, by Bureau Reclamation, Metropolitan Water Dist., Camp 1, constructing 32x65 ft. office Building and 42x112 ft. dormitory at Government Camp., at Parker Dam, about 16 mi. east of here, Parker Dam Project, California-Arizona.

†Colo., Salida—Nov. 23, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

†Colo., Walsenburg—Dec. 3, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

†D. C., Wash.—Nov. 14, by Treas. Dpt. at office Sup. Archt., Wash., D. C., altering and constructing metal and glass partitions for Federal Warehouse.

†D. C., Wash.—Nov. 6, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. signal system in Dept. of Justice Building.

†Ill., Moline—Nov. 20, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. Noted Aug. 9.

†Ill., Oak Park—Nov. 15, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

†Ky., Winchester—Nov. 29 (extended date) by Treas. Dpt. at office Sup. Archt., Wash., D. C., extending U. S. Post Office. Noted Oct. 18.

†Me., Bangor—Nov. 5 (extended date) by Treas. Dpt. at office Sup. Archt., Wash., for elevator in U. S. Post Office. Noted Oct. 18.

†Me., Rockland—Nov. 23, by Treas. Dpt. at office Sup. Archt., Wash., D. C., extending and remodeling U. S. Post Office.

Mass., Lawrence—Nov. 5, by City Dpt. Public Buildings, 2 story, 110x115 ft., brick, steel hospital and heating plant, plain found., Mission St. $150,000. P.W.A. project. Ashton & Hunstress, 477 Essex St., Lawrence, archts. Noted May 24.

†N. H., Newport—Nov. 22, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. Noted Aug. 2.

†N. J., Freehold—Nov. 15, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. Noted Feb. 2, 1933.

†N. J., Newark—Nov. 9, by Treas. Dpt. at office Sup. Archt., Wash., D. C., special interior and exterior lighting fixtures.

N. Y., Monticello—Nov. 9, by Bd. Educ., general contract school. Tooker & Marsh, 101 Park Ave., New York, archts. Noted Sept. 6.

†N. Y., New York—Nov. 9 (extended date) by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. Cross & Cross, 515 Madison Ave., New York, archts. Noted Oct. 11.

†N. Y., Stapleton—Nov. 23, by Treas. Dpt. at office Sup. Archt., Wash., D. C., surgical operating lighting fixtures in U. S. Marine Hospital.

†N. Y., Stapleton—Nov. 21, by Treas. Dpt. at office Sup. Archt., Wash., D. C., interior lighting fixtures for U. S. Marine Hospital.

N. Y., Wassaic—Nov. 21, by Dpt. Mental Hygiene, State Office Bldg., Albany, completing sanitary work, administration building, accommodations for inmates (medical and surgical buildings), superintendent's residence and school building with auditorium, Wassaic State School.

†O., Westerville—Nov. 13, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

†Okla., Claremore—Nov. 26, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office. Noted Aug. 2.

†Pa., Catasaugua—Nov. 20, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

†Pa., Nazareth—Nov. 6 (extended date), by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

†Pa., Plymouth—Nov. 13, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office.

R. I., Burrillville (mail Harrisville)—Nov. 5, by State, Dr. H. L. Barnes, supt. Wallum Lake Sanitorium, State House, 3 story, basement, irregular sized, brick nurses home, concrete found., at Wallum Lake Sanitorium, $145,000 up. P.W.A. project. Shapiro & Ekman, 72 Weybosset St., Providence, archts. C. E. Blais, State Engr. Howard Institutions, Howard, engr.

S. C., Columbia—Nov. 14, at office Governor I. C. Blackwood, chn. World War Memorial Comn., 2 story, basement, 75x75 ft., limestone face memorial, Sumter and Pendleton Sts., for State. $110,000. Lafaye & Lafaye, 1226 Sumter St., archts. Col. M. Johnson, Marion, chn. Building Com. Noted Dec. 21.

†Tenn., Greenville—Nov. 21, by Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office and Court House. $30,000.

Tex., Austin—Nov. 28, by University of Texas, for administration-library building, main structure 5 stories high, 310 ft. or 24 story central tower, Indiana limestone, $1,800,000. Project being financed by $1,200,000 P.W.A. loan and $433,000 direct Federal grant, remainder to come from University financial sources. Noted Jan. 25. Also application to P.W.A. for $450,000 loan to construct 2 dormitories has been approved.

Ont., Ottawa—Nov. 30, by Secretary Dpt. P. Wks., Ottawa, 9 story, 2 sub-basements, 153x187 ft., brick, steel, stone office Building, plain found., Wellington St., for Royal Canadian Mounted Police, $1,200,000. T. W. Fuller, Dpt. P. Wks., Ottawa, archt. Noted Apr. 26.

Que., Montreal—Nov. 20, by Secretary Dpt. P. Wks., Ottawa, Ont., 8 story, basement, 137x200 ft., rein.-con., brick public office building, plain found. $2,000,000. T. W. Fuller, Ottawa, Ont., archt.

†Federal Government.

Public Buildings (Continued)

CONTRACTS AWARDED

†**Calif., LaJolla**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to F. L. Stimson Constr. Co., 1111 Wall St., Los Angeles, $38,000. Bids Oct. 12. Noted Sept. 12.

Calif., Long Beach—Long Beach Bd. Educ., reconstructing, rehabilitating and strengthening auditorium building at Polytechnic High School, to Person & Thiele Co., 6206 San Vincente Blvd., Los Angeles, $135,800. **P.W.A.** Noted Sept. 27.

†**Calif., Orange**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to L. F. Dow Co., 414 Rowan Bldg., Los Angeles, $36,735. Bids Oct. 12. Noted Sept. 13.

Calif., San Francisco—S. J. Hester, secy. Dpt. P. Wks., City Hall, general contract 3 story, rein.-con. high school known as George Washington School, 30th and 3rd Aves., Geary and Balboa Sts., for City and San Francisco Co., to Meyer Constr. Co., 735 Portola Dr., $595,567***mechanical equipment, to Anderson & Rowe, 45 Belcher St., $82,917***electrical work, to Lynn & Hefferman, 114 Ashton Ave., $56,510. Grand total $734,994. Bids Sept. 26. Noted Sept. 13.

†**Calif., Yosemite Park**—National Park Service. Underwood Bldg., San Francisco, 1 and 2 story, 70x260 ft., rein.-con., utility building, to L. S. Peletz, 1660 West Acacia St., Stockton, $111,787. Bids Aug. 28. Noted Aug. 9.

†**Conn., Bristol**—Treas. Dpt. at office Sup. Archt., Wash., D. C., clearing site for Post Office, to New York & Hartford Wrecking Co., 619 Windsor St., Hartford, $950. Bids Oct. 26. Noted Oct. 25.

Conn., Hamden—Town, R. F. Collins, chn. School Comn., Hamden, Memorial Town Hall, plumbing for 2 story, basement, brick, artificial stone, granite and steel high school, Dixwell Ave., to A. J. Mongillo, 928 Grand St., New Haven***excavating, to Julius Varvello, Inc., 575 Columbus Ave., New Haven. **P.W.A.** Noted Sept. 27, under "Contracts Awarded."

†**Del., Wilmington**—Treas. Dpt. at office Sup. Archt., Wash., D. C., excavating and grading, U. S. Post Office, to D. M. Fontana, 1601 Michigan Ave., $3,700. Bids Oct. 18.

†**D. C., Wash.**—Treas. Dpt. at office Sup. Archt., Wash., D. C., changes to present buildings at National Institute of Health, to Temple Constr. Co., 11 West 42nd St., New York, $64,200. Bids Oct. 8. Noted Sept. 27.

†**Ga., Waycross**—Treas. Dpt. at office Sup. Archt., Wash., D. C., extending and remodeling U. S. Post Office and Court House, to Dice-Schmidt Constr. Co., 2440 Indiana Ave., Chicago, Ill., $117,600. Bids Oct. 15. Noted Sept. 27.

†**Ill., Joliet**—U. S. Eng., Post Office, Chicago, erecting steel pattern storage building, to Stefco Steel Co., Michigan City, Ind., $2,232. Bids Sept. 26. Noted Sept. 13.

†**Ill., Morrison**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to Weitz Co., 713 Mulberry St., Des Moines, Ia., $32,754. Bids Sept. 21. Noted Sept. 13.

†**Ind., Terre Haute**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to F. R. Comb, 2113 Chicago Ave., Minneapolis, Minn., $50,853. Bids Oct. 15. Noted Sept. 27.

Mass., Boston—Matthew Cummings Co., general contractors, 43 Tremont St., Boston, caissons for 9 story, basement, 100x209 ft., brick, concrete, cast stone and granite and surgical and ward building, to New England Foundation Co., 38 Chauncy St., Boston***elevators, to Otis Elevator Co., 130 Clarendon St.***heating and ventilating, to J. J. Hurley, 104 Bway.***plumbing, gas piping and sprinklers, to C. H. Cronin, Inc., 14 Byron St.***electrical work, to Quinn Bros., 150 Warren St., Roxbury, for City, Trustees City Hospital, J. P. Manning, pres., 818 Harrison Ave. Noted Sept. 20, under "Contracts Awarded."

Mass., Dorchester—Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, electric wiring in power plant, at Boston State Hospital, to M. B. Foster Electric Co., 514 Atlantic Ave., Boston, $32,843. **P.W.A.** Bids Oct. 9, awarded Oct. 19. Noted Oct. 4.

Mass., Norfolk—M. Spinelli & Sons, general contractors, 38 Chauncy St., Boston, plumbing for 2 large Industrial Buildings A and D at State Prison Colony, to H. J. Lyons, 49 Fore River Ave., Weymouth***heating, to J. P. Dwyer Co., 254 Harrison Ave., Boston***electrical work, to Lord Electric Co., 303 Columbus Ave., Boston***elevators, to Portland Elevator Co., 146 Oliver St., Boston***sprinklers, to Grinnell Co., Inc., 131 State St., Boston, for Commonwealth of Massachusetts, Dpt. Correction, office of Superintendents, State Prison Colony. Noted Sept. 27, under "Contracts Awarded."

Mass., South Boston (sta. Boston)—City of Boston, Dpt. School Buildings, W. W. Drummey, supt. constr., 11 Beacon St., Boston, general contract Shurtleff School, 3 story, basement, 170x168x142 ft., brick, limestone, Dorchester and F Sts., Thomas N. Hart Dist., South Boston, to Rugo Constr. Co., 80 Boylston St., Boston, $642,000. **P.W.A.** Bids Oct. 3, awarded Oct. 23. Noted Sept. 20.

†*Federal Government.*

†**Mich., Hudson**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to Murch Bros., 4111 Lindell Blvd., St. Louis, Mo., $35,732. Bids Aug. 30. Noted Aug. 9.

†**Neb., Lexington**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to W. S. Assenmacher Co., 625 North 17th St., Lincoln, $36,000. Bids Oct. 11. Noted Sept. 27.

†**N. H., Lancaster**—Treas. Dpt. at office Sup. Archt., Wash., D. C., general contract U. S. Post Office, to R. W. Erickson, 119 South 4th St., Phila., Pa., $38,480. Bids Sept. 4. Noted Aug. 23.

N. J., Bordentown—Dpt. Institutions & Agencies, State Office Bldg., Trenton, general contract buildings at New Jersey State Prison Farm, to Pellechia Contg. Co., 50 Branford Pl., Newark, $603,300***electrical work, to Buhl & Caffrey, 35 Hudson St., Newark, $71,961*** plumbing, to Arace & Co., Newark, $59,690*** heating, to F. Farrell, 269 Camden St., Newark, $67,066***disposal plant and pumps, to N. A. K. Bugbee Co., 206 East Hanover St., Trenton, $69,983***waterlines, to T. McGovern, New Brunswick, $17,285***water tower, to Pittsburgh-Des Moines Co., 270 Bway., New York, N. Y., $10,365***smoke equipment, to C. W. Carll & Sons, Cole St., Trenton, $1,122. Grand total $900,762. Bids Oct. 2, awarded Oct. 23. Noted Sept. 20.

N. J., Marlboro—Dpt. Institutions & Agencies, State Office Bldg., Trenton, general contract 2 buildings at New Jersey State Hospital, to A. A. LaFountain, Beech St., Hackensack, $264,400 ***plumbing, to W. Bittner, 2015 Hamilton Ave., Trenton, $25,315***heating, to Hadley Contg. Co., Palmyra, $29,860***electrical work, to Brown Electric Co., 10 New Jersey Ave., Trenton, $13,350***structural steel and ornamentation, to Maxwell Spiro, 241 Communipaw Ave., Jersey City, $21,490. Grand total $354,374. Bids Oct. 5. Noted Sept. 27.

†**N. M., Silver City**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to R. E. McKee, 1918 Texas St., El Paso, Tex., $39,875. Bids Aug. 31. Noted Aug. 9.

†**N. Y., Ellis Island**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing addition to Immigration Station, to G. F. Driscoll Co., 548 Union St., Brooklyn, $359,960. Bids Oct. 8. Noted Sept. 27.

N. Y., Lawrence—Bd. Educ., plumbing for high school, to H. Barrow Co., Hempstead, $24,465; lighting, to Arc Electric Constr. Co., 739 2nd Ave., New York. (**Correction**—Addresses for contractors'). Noted Oct. 25, under "Contracts Awarded."

N. Y., Remsen—Bd. Educ., general contract 2 story, basement, 124x130 ft., brick school, plain found., to Bedford Constr. Co., 1300 Broad St., Utica, $137,202***plumbing, to W. P. Hoffmeister, Utica, $13,525***heating, to P. W. Schneider, 307 LaFayette St., Utica, $23,342*** electrical wiring, to Doster & Egon, 204 Erie Blvd., Syracuse, $10,447***painting, to Lionel Kemp, Utica, $2,198. Grand total $186,724. **P.W.A.** Bids Oct. 23.

†**N. C., Pinehurst**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to A. Blair, Montgomery, Ala., $36,727. Bids Aug. 31. Noted Aug. 9.

†**Ore., Hillsboro**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to J. H. Anderson, 3132 Northeast 6th Ave., Portland, $39,260. Bids Oct. 9. Noted Sept. 13.

†**Ore., Hood River**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to Hoffman Constr. Co., 715 Southwest Columbia St., Portland, $37,580. Bids Sept. 28. Noted Sept. 13.

Pa., Bradford—Havens & Coughlin, general contractors, Olean, N. Y., structural steel for 3 grade schools, to Shippers Car Line, Milton, Pa.; reinforcing steel, to Concrete Steel Co., Durston Bldg., Syracuse, N. Y., for Bd. Educ., J. B. Butterworth, supt. Noted Sept. 13, under "Contracts Awarded."

Pa., East Brady—M. E. Miller, secy. East Brady School Dist., furnishing, installing boilers, stokers, equipment, etc., for school district, to William M. Clark & Co., 297 South Beaver St., New Castle, $7,169; boiler house and heating plant, to F. R. Shaffer, East Brady, $1,420. Bids Sept. 27. Bids Sept. 28, awarded Oct. 10. Noted Sept. 20.

†**Pa., Phila.**—Treas. Dpt. at office Sup. Archt., Wash., D. C., mechanical changes, U. S. Mint, to Drake Avery Co., 147 West Woodridge St., Detroit, Mich., $35,269. Noted Sept. 20.

†**Pa., Scottsdale**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office, to J. J. Bendix, 65 North Mount Vernon Ave., Uniontown, $42,680. Bids Oct. 17. Noted Sept. 27.

R. I., Barrington—Town, C. H. Keyes, supt. Schools, general contract 2 story, 60x90 ft., brick, limestone, steel high school (Leander Peck) addition, to J. W. Bishop Co., 1415 Turks Head Bldg., Providence, $77,650***plumbing, to Joseph Cuddigan & Son, 938 Bway., East Providence***heating, to H. L. Graham & Son, 146 High St., Pawtucket***electrical work, to Scannevin & Potter, 189 Pine St., Providence. Bids Oct. 18, awarded Oct. 19. Noted June 14.

R. I., Cranston—City, City Property Comn., City Hall, plumbing for terminal garage, Phoenix Ave., to J. M. Shanley, 31 Gurney St., East Providence, $1,200***heating, to J. P. Cuddigan, 938 Bway., Providence, $3,239*** electrical work, to Hughes Electric Co., 1421 Broad St., Edgewood, $1,688. Grand total $6,127. Noted Oct. 25, under "Contracts Awarded."

R. I., Glocester (Mail Putnam, Conn.) — Town, Public School Dpt., G. W. Mitchel, supt., electrical work for schools in Chepachet and Harmony Dists., to A. B. Baxter Co., 64 Orange St., Providence; pumps, to Chase Pump & Equipment Co., Washington St., Providence. **P.W.A.** Noted Sept. 27, under "Contracts Awarded."

†**Vt., Highgate Springs**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing inspection station, to W. H. Trumbull, 11 Lebanon St., Hanover, N. Y., $67,628. Bids Sept. 26. Noted Sept. 13.

†**Wis., Eau Claire**—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing U. S. Post Office and Court House, to Hoeppner Bartlett Co., 631 East Madison St., $38,350. Bids Oct. 19. Noted Sept. 27.

Wis., Wausau—Bd. Educ., general contract 3 story, 65x208 ft. high school and 74x100 ft. gymnasium, to F. W. Krause, Wausau, $171,880 ***electrical work, to A. H. Meyer, Oshkosh, $8,784***plumbing, to J. E. Robertson Co., 1409 Underwood Ave., Wauwatosa, $16,500. Grand total $197,224. **P.W.A.** General contractor sublet millwork, to Curtis & Yale, Wausau; excavation, to C. Lutz, Wausau; structural steel and ornamental iron, to Wausau Iron Wks., Wausau; reinforcing steel, to Hustad Co., 529 South 7th St., Minneapolis, Minn.; cast stone, to Chicago Architectral Cast Stone Co., 332 South Michigan Ave., Chicago, Ill.; metal joists, to Kalman Steel Co., 212 West Wisconsin Ave., Milwaukee. Noted Jan. 25.

Sask., Lebret—Dpt. Indian Affairs, constructing Qu' Appelle Indian Residential School, to Smith Bros. & Wilson Ltd., Regina, $164,926.

COMMERCIAL BUILDINGS

PROPOSED WORK

Calif., Los Angeles—M. Factor, Hawthorne and Highland Aves., plans by S. C. Lee, 2404 West 7th St., 4 story, 140x200 ft., rein.-con. cement plaster, side and rear addition to commercial building Hawthorne and Highland Aves. $250,000.

Conn., Hartford—Trinity College, 115 Vernon St., bids after Dec. 1, general contract chemistry laboratory, opposite Jarvis Hall. $400,000. McKim, Mead & White, 101 Park Ave., New York, archts. Noted June 28.

Ill., Chicago—Bond Holders Committee Receiver American Natl. Bank, 33 North LaSalle St., plans altering brick, steel hotel, 40 East Oak St. $345,000. Architect and engineer not appointed.

N. J., Teaneck—Kings Builders, Inc., c/o F. Innganamorte, 508 West Englewood Ave., plans development of 10 acre tract, incl. 75 dwellings, Belle Ave. Architect not appointed.

N. Y., Brooklyn—Bway. Savings Bank, 5 Park Pl., New York, will award contract early in November from bids submitted by selected bidders for altering heating and plumbing 5 story apartment, State and Bond Sts. $28,000. F. P. Platt & Bro., 221 West 57th St., New York, archts. Noted Oct. 18.

N. Y., Brooklyn—Corporation, c/o H. Lefrack, 897 Empire Blvd., plans by Kavy & Kavovittt, 16 Court St., 6 story, 90x125 ft., brick apartment, 50th St. and 14th Ave. $200,000.

N. Y., Brooklyn—S. Glasterstein, 50 Court St., plans by S. Malkind, 105 Court St., 6 story, 78x107 ft., brick, apartment, Ocean Parkway and Webster Ave. $125,000.

N. Y., Brooklyn—R. L. Goetz, 311 Marine Ave., plans by J. Gabatchnik, c/o owner, 6 story, basement, brick apartment, 16 94th St. $150,000.

N. Y., Brooklyn—W. Robb, 465 East 95th St., plans by Kavy & Kavovitt, 16 Court St., 6 story, brick apartment, plain found., 1464 52nd St. $120,000.

N. Y., Brooklyn—Williamsburg Savings Bank, 175 Bway., plans by I. Prowler, 367 Fulton St., altering heating and plumbing in 4 story, apartment, Greenpoint and Manhattan Aves. $28,000.

N. Y., Jackson Heights—Lynbrook Realty Corp., J. Perlbinder, pres., c/o Queensboro Corp., 81-20 37th Ave., plans 6 story, 110x200 ft., brick, steel, apartment, concrete founds., incl. elevators, refrigeration, etc., 75th Ave. and 74th St. $200,000.

N. Y., Jackson Heights—Apex Homes, 3744 82nd St., plans by M. Rothstein, 391 Fulton St., Brooklyn, constructing 16 brick dwellings with concrete block garages, 77th St. and 31st Ave. $105,000.

N. Y., Larchmont—C. W. Moody, Althea Lane, plans group dwellings, Rouken Glen. To exceed $100,000.

N. Y., Laurelton—Laurelton Homes, 229-15 Merrick Rd., plans group 2 story, brick dwellings, Merrick Rd. and 230th St. $100,000 or more.

N. Y., Long Island City—Building Corp., 940 East 9th St., Brooklyn, plans by Cohn Bros., 191 Joralemon St., Brooklyn, 6 story, 85x190 ft., brick store and apartment, 47th Ave. and 43rd St. $200,000.

N. Y., Long Island City—Forty-Second Street Building Corp., 940 East 9th St., plans by B. Cohen, c/o owner, 6 story, 85x190 ft., brick.

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Commercial Buildings (Continued)

steel apartment, 43rd St. and 47th Ave. $200,000.

N. Y., New York—Corporation, c/o Handy & Schloss, 285 Madison Ave., plans by Voorhees, Gmelin & Walker, 101 Park Ave., altering heating and plumbing in 6 story apartment, 601 Cathedral Parkway. $35,000.

N. Y., New York—Corporation, c/o L. P. Ernst, 778 East 179th St., plans 6 story, brick apartment, 208th St. and Kossuth Ave. To exceed $110,000. Architect not appointed.

N. Y., Queens Village—Architectural Building Corp., 137-67 Queens Blvd., Jamaica, plans by A. MacLean, 149-27 Jamaica Ave., Jamaica, group thirty-two 1 and 2 story brick, frame dwellings, 219th St. and 113th Dr. $110,000.

N. Y., St. Albans—Excelo Homes Corp., 124-17 109th Ave., Richmond Hill, plans by A. Allen, Garden City, group 22x33 ft. dwellings, 118th Ave. and 219th St.

S. C. Ware Shoals—Ware shoals Mfg. Co. plans group of 250 dwellings for workers village.

Tex., Houston—H. C. House, Interest, Union Natl. Bank Bldg., plans by H. F. Jones & Tabor, Union Natl. Bank Bldg., 4 story, brick, concrete theatre and garage, Milam and Capitol Sts. $650,000. Horowitz Theatres, 814 Capitol St., lessee.

BIDS ASKED

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Harrison—See "Contracts Awarded."

CONTRACTS AWARDED

Conn., Hartford—G. Fox & Co., 970 Main St., iron stairway and ornamental metal work for store alterations, Main St., to Gorham Co., Providence, R. I., $7,750; interior marble, to White & Clark, Inc., 32 Ford St. Noted Jan. 25, under "Contracts Awarded."

Mich., Kalamazoo—Albert Kahn, Inc., archts., New Center Bldg., Detroit, 3 story, basement, 54x208 ft., brick, steel, rein.-con., stone office building, and daylight restaurant, to F. Miller Co., Kalamazoo, for Upjohn Co., Kalamazoo. Noted Oct. 4.

N. Y., Brooklyn—Caton Towers, Inc., 191 Joralemon St., 6 story, brick apartment, Caton and Flatbush Aves., separate contracts, $125,000. W. T. McCarthy, 147 Pierrepont St., archt. Noted Sept. 27.

N. Y., Brooklyn—Lebern Builders, 26 Court St., 94x170 ft., brick, steel store, apartment, Shore Rd. and 97th St., separate contracts, $275,000. Owner now taking bids. Cohn Bros., 191 Joralemon St., archts. Noted Oct. 18.

N. Y., Brooklyn—Piermont Constr. Co., 16 Court St., elevators, etc., for two 6 story store and office buildings, Montague, Pierrepont and Hicks Sts., to Seaberg Elevator Co., 427 Douglas St. Est. $28,000. Noted Oct. 18.

N. Y., Harrison — Meuer & Auerbach, 99 Mamaroneck Ave., White Plains, tract and residential development, on 200 acres site, Spencer Glen, separate contracts. To exceed $125,000. L. M. Loeb, c/o owner, archt. Noted Oct. 18.

N. Y., New York—Fordham University, Fordham Rd., New York, college (classroom) building to Sobray-Whitcomb, 105 West 30th St., New York. Est. $500,000. Contractor awarded contract for structural steel, to Bethlehem Fabricators, Bethlehem, Pa. Noted Aug. 2.

N. Y., New York—Public National Bank & Trust Co., 76 Williams St., general contract 3 story, basement, mezzanine, 61x88 ft., limestone, granite, steel bank, 102-04 Orchard St. and 85-87 Delancey St., to Rheinstein Constr. Co., 21 East 40th St., New York, approximately $200,000. Noted Aug. 23.

INDUSTRIAL BUILDINGS

PROPOSED WORK

Calif., Santa Cruz—TANNERY—A. K. Salz Tannery, S. Miller, genl. mgr., plans rebuilding tannery destroyed by fire. $35,000 incl. equipment.

Calif., Stockton — LUMBER PLANT — Santa Fe Lumber Co., 16 California St., San Francisco, soon takes bids 1 story, corrugated iron shipside plant, 500 ft. long and 78 ft. wide. $35,000. Private plans.

Me., Brunswick—SUPER-SERVICE STATION—Jenney Mfg. Co., 8 India St., Boston Mass., soon lets contract constructing 1 story, basement, irregular sized, brick, super-service station, incl. heating, plumbing, electrical work, tanks, pumps, pipe lines, grease pits, pavement, etc., concrete found., Main St. W. A. Gott, owners engrs.

Md., Baltimore—SUB-STATION—Gas & Electric Co., Lexington Bldg., plans by A. D. Loizeaux, c/o owners, 2 story, 60x80 ft., brick, concrete electric substation. To exceed $30,000 with equipment.

Md., Baltimore—WAREHOUSE, etc.—Gunther Brewing Co., 1211 South Conkling St., plans 1 story, 60x200 ft. warehouse, 2 story, 100x200 ft. washing and packing house, Conklin and Toone Sts. C. H. Osborne, 222 West Franklin St., engr.

Md., Baltimore—PLANT—Goodyear Tire & Rubber Co., 1144 East Market St., Akron, O., soon let contract 2 story, basement plant, Mt. Royal Ave. and Oliver St., $150,000. Wilbur Watson & Associates, 4614 Prospect Ave., Cleveland, O., archts. Noted Oct. 25.

Mass., Boston—PLANT—Metal Package Corp., 110 East 42nd St., New York, and Boston, plans plant expansion. To exceed $50,000.

Mich., Detroit—FACTORY—Bohn Aluminum & Brass Corp., 2512 East Grand Blvd., making plans 2 story, brick, rein.-con., steel plant extension, plain found. $50,000. Private plans.

Mich., Detroit—PLANT—Bower Roller Bearing Co., 3040 Hart St., plans by A. Kahn, New Center Bldg., plant addition. $30,000 or more.

N. J., Hackensack—BUS TERMINAL—Garden State Lines, 550 West 167th St., New York, plans by A. Dore, 398 Main St., bus terminal. $50,000 or more.

N. J., Newark—STORAGE, etc.—Cedar Hall Realty Co., 121 Halsey St., plans 70x150 ft. storage and store, 121 Halsey St. $30,000 or more. Architect not appointed. Bluehall Holding Corp., c/o A. M. Greenfield Co., 17 Academy St., lessee.

N. M., White Oaks—POWER PLANT—New Mexico Power & Light Co., White Oaks, plans electric power plant. Est. about $100,000.

N. Y., Albany—DOCK SHIPPING GALLERY—Cargill Grain Co., 342 South Dearborn St., Chicago, Ill., plans dock shipping gallery, Hudson River. $55,000.

N. Y., Albany—FACTORY—A. P. W. Paper Co., 1273 North Bway., plans converting mill building into paper factory, also new construction, North Albany. $450,000. Architect and engineer not appointed.

N. Y., Brooklyn—PLANT EXTENSIONS—Metal Packing Corp., 110 East 42nd St., New York, plans plant extensions and equipment. 346 Carroll St. To exceed $100,000.

N. Y., Brooklyn—STORAGE—Tannin Corp., 500 5th Ave., plans by A. McNulty, 51 East 42nd St., New York, 1 story storage, Huron and Freeman Sts. and East River. $50,000.

O., Cincinnati — POWER HOUSE — Oliffrich Brewing Co., 242 West Micken St., plans by Fosdick & Hilmer, archt. and engr., Union Trust Bldg., power house for brewery. To exceed $40,000.

O., Toledo—PLANT—E. I. DuPont de Nemours & Co., Wilmington, Del., plans reconditioning and constructing extensions to former Mountain Varnish & Color Co. plant. $225,000 incl. equipment, to be equipped for manufacture of auto enamel.

R. I., Cranston—BOTTLING PLANT—Narragansett Brewing Co., Arlington Sect., bids early in November, 2 story, basement, rein.-con. bottling plant. $40,000. E. M. Corbett, 49 Purchase St., Fall River, Mass., archt.

Tex., McAllen—PEA CANNERY—Columbus Foods Corp., Columbus, Wis., plans pea cannery. To exceed $30,000. Maturity depends upon results from operation of experimental unit.

Ont., Tillsonburg—STORAGE—Canadian Leaf Tobacco Co. Ltd., plans 3 story, 160x160 ft. storage building. Site purchased.

Que., Hudson—ICE STORAGE—Hudson Ice Co. plans ice storage plant. To exceed $70,000. Architect not appointed.

Que., Levis—STORAGE—Robin Hood Flour Mills plans storage building to replace burned warehouse. $30,000 or more. Architect not appointed.

BIDS ASKED

Ga., Valdosta — PLANT — Sowega Fertilizer Assn. and Sewega Melon Assn., Valdosta, taking preliminary bids fertilizer plant and equipment. To exceed $30,000.

Ill., Peoria—DISTILLERY—Hirman, Walker, Gooderham & Worts, Peoria, taking bids 3 story, basement, brick, steel, concrete distillery, Smith, Hinchman & Grylls, 800 Marquette Bldg., Detroit, Mich., archts. and engrs. Noted Sept. 20.

N. Y., New York—GARAGE and SHOP—See "Contracts Awarded."

S. D., Central City—BREWERY—Black Hills Brewing Co., taking bids brewery and equipment. To exceed $28,500.

Tenn., Chattanooga — WAREHOUSE — A. B. Blount, 1026 Grove St., taking bids 1 story, basement, 40x90 ft., brick, concrete, rein.-con., plain found., Grove St. $30,000. M. Mabry, Rossville, Ga., archt. Noted Oct. 18.

Wis., Wausau — BREWERY — Oppenhamer & Obel, archts., Wausau, taking bids 4 story, 32x61 ft., brick, steel, plain found., for Wausau Brewing Co., J. T. Fernock, mgr.

Ontario — GOLD MINING — See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Escondido—PACKING HOUSE—Escondido Lemon Assn., R. G. Beck, mgr., 3 story, 103x334 ft., packing house addition, to J. R. Murray, 4567 Texas St., San Diego. Est. $100,000. Work started.

Calif., Stockton — MILK PLANT — Morning Milk Co., Stockton, condensary and milk plant, 55,000 gal. per day capacity, Boggs Tract, to J. A. Allen, 22 South Sutter St., cost plus basis. Awarded Oct. 12. Noted Sept. 27.

Conn., Groton—PLANT—Electric Boat Co., Groton, general contract 2 story, basement, 30x50 ft., brick, steel plant, to H. R. Douglas & Son, 253 State St., New London***structural steel, to Topper & Griggs, 200 North Main St., West Hartford***steel sash brick, to Thames Lumber Co., Eastern Ave., New London. Est. $28,500.

Mass., Jamaica Plain—MANUFACTURING—J. L. Cabel, 11 Melville Ave., Dorchester, re-building foundation under present 4 story, 40x40x60 ft. brick, stone manufacturing plant and constructing 1 story, 60x90 ft. addition, Union Ave., to M. W. Freeman, 56 Quincy St., Roxbury, to exceed $28,500. Work started. A. J. Carpenter, 1 Moss Hill Rd., archt.

Mass., Salem—FACTORY—S. L. Agoos Tanning Co., Inc., 14 Franklin St., 2 story, basement, 30x125 ft., brick, concrete leather factory addition, to N. Little, 8 Eagan Pl., Peabody. $35,000. (Tentative award.) Private plans. Awarded Oct. 25.

Mass., Somerville—WAREHOUSE—Vacuum Co., W. Atkinson, treas., 57 Mystic Ave., 1 story, irregular sized warehouse addition Mystic Ave., separate contracts; caisson found. to New England Foundation Co., 38 Chauncy St., Boston. Remainder of building will not be constructed until next spring. To exceed $40,000. Chas. T. Main, Inc., 201 Devonshire St., Boston, engrs.

Mass., Worcester — POWER PLANT — F. J. Sill, engr., East Main St., Westboro, boilers for 1 story, concrete power house addition to Riler Stoker Corp., 27 State St., Boston; coal handling equipment, to Stephens-Adamson Mfg. Co., 31 St. James Ave., Boston, for Crompton & Knowles Loom Wks., 93 Grand St. Concrete work, piping and electrical work by owners. Total est. exceeds $40,000. Noted Oct. 11.

N. Y., New York—GARAGE and SHOP—Worthen Realty Corp., 4720 Bway., J. Byrell, treas., 2 story, 100x100 ft., brick, concrete, 156th and Truxton Sts., separate contracts, $30,000 or more. N. Rotholz, 155 East 42nd St., archt. Noted Oct. 11.

N. Y., Rochester—FACTORY—Eastman Kodak Co., Kodak Park, general contract 1 story, basement, 80x150 ft., brick addition to Factory Building 201, plain found., Kodak Park, to Ridge Constr. Co., c/o owner; structural steel, to Leach Steel Corp., 80 Steel St. Est. exceeds $28,500.

O., Cincinnati—BULK STORAGE—Tower Oil Co., 607 Mitchell Ave., bulk storage, to Daw-son-Evans Constr. Co., 5300 Vine St. Est. $45,000.

O., Youngstown—MILL—Youngstown Sheet & Tube Co., Stambaugh Bldg., cold rolling mill at Campbell, adjacent to here, to Mesta Machine Co., Pittsburgh, Pa.; erecting steel for same, to Fort Pitt Bridge Co., Pittsburgh, Pa., 3,000 tons structural materials will be used. New mill to have capacity of 200,000 to 250,000 tons annually of strip products. Cold mill rodding equipment will be housed in separate building covering 216,000 sq.ft. to be completed by Apr. 1, 1935. The work to start shortly. To exceed $2,500,000. Noted Oct. 25.

Wis., Green Bay—PAPER MILL—Fort Howard Paper Co., general contract 1 story, 60x120 ft. and 1 story 53x75 ft. paper mill additions, to Selmer Co., Green Bay***cement stone, to Northern Coal & Supply Co., Green Bay*** brick, to Gaynon Clay Products Co., Green Bay ***roofing, sheet metal, to Badger Sheet Metal Wks., Green Bay***fire doors, to H. W. Martin, Green Bay***structural steel, to Wisconsin Bridge & Iron Co., 5023 North 35th St., Milwaukee***reinforcing steel and steel sash, to Concrete Eng. Co., 176 West Wisconsin Ave., Milwaukee.

Wis., Sheboygan—CAR STORAGE—Reiss Coal Co., 2 story, 60x100 ft., brick, steel car storage building, day labor***heating, to C. A. Honold, Sheboygan***plumbing, to Zurheide & Sons, Sheboygan***overhead doors, to L. F. Meier, Sheboygan***brick, to Van der Vaart Brick & Building Supply Co., Sheboygan. E. A. Jeuni, Sheboygan, archt.

Man., Winnipeg—PLANT—Western Vinegars Ltd., 468 Redwood Ave., E. L. Isard, genl. mgr., 2 story, 70x140 ft., brick, tile addition, to Malcolm Constr. Co., 445 River Ave., $60,000.

Ontario—GOLD MINING—Rainy-River-Kirkland Gold Mines, c/o R. N. Crowell, Kempville, N. S., or E. C. Strong & Co., 40 Exchange Pl., New York, N. Y., gold mining development in various locations, day labor. To exceed $100,000.

Ont., London—FACTORY—Silverwoods Ltd., A. E. Silverwoods, pres. and gen'l. mgr., 2 story, basement, 45x75 ft., rein.-con., brick, steel addition, to R. G. Wilson & Son, 193 College St., $50,000.

Ont., Ottawa—FACTORY—British-American Bank Note Co., Wellington St., 2 story, basement, brick, rein.-con., stone addition to Bank Note Building, plain found., Wellington St., to A. Garvock, Sparks St. Est. $40,000. Awarded Oct. 18.

Ont., Ottawa—FACTORY—Continental Paper Products Ltd., Wellington St., 2 story, basement, rein.-con., brick addition, plain found., to Foundation Co. of Canada Ltd., Montreal Que. Est. $35,000. Awarded Oct. 10.

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For official proposal advertising see Searchlight Section

†*Federal Government.*